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Firecode

Health Technical Memorandum 83

Fire safety in healthcare premises – General fire precautions

UK Health Departments

NHS Estates
An Executive Agency of the Department of Health

Firecode

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Fire safety in healthcare premises – General fire precautions

London : HMSO

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About this publication

In this Health Technical Memorandum (HTM) and the associated Firecode documents, reference to "general managers" means general managers of health authorities and reference to "chief executives" means chief executives of NHS trusts. References to "health authorities" include NHS trusts in appropriate circumstances.*

Fire safety measures for the whole hospital

The primary remit of health authorities with regard to fire safety is the safety of patients, all visitors, and health service staff. For the application of effective fire precautions in hospitals and other healthcare premises, health authorities will need to select a combination of measures to produce a fire-safe design, taking the following points into account:

- this Health Technical Memorandum and associated Firecode documents (refer to Appendix 7);
- all statutes and guidance relevant to the scheme as a whole;†
- the advice and approval of local building control and fire authorities;
- the advice of health authority staff (estates staff, hospital fire safety and building control advisers etc).

The Home Office will distribute this Health Technical Memorandum to all chief fire officers. The HTM should be used as a basis for discussions with local fire authorities.

Health Technical Memorandum 83

This Health Technical Memorandum is an important component of Firecode. It covers a range of general fire safety measures which apply throughout hospital premises administered by health authorities and NHS trusts. The main purpose of the document is to provide guidance for hospitals, but its general principles may have relevance to other healthcare premises in appropriate circumstances.

This HTM should be read in conjunction with Firecode: 'Policy and principles' and related Firecode guidance, and frequent reference is made to it by these documents. A number of Firecode's Fire Practice Notes (FPNs) provide specific information on hospital locations with particular fire hazards that are mentioned in this memorandum.

General managers of health authorities, chief executives of trusts, nominated officers (fire), and hospital fire safety advisers should acquaint themselves with the contents of this document, particularly those sections dealing with management policy, staff training and fire prevention.

The memorandum replaces that of 1982 having the same title, and takes effect from 1 April 1994.

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* General references to health authorities throughout this document are meant to refer to the appropriate "health service bodies" as defined in Section 60(7) of the NHS and Community Care Act 1990, and to NHS trusts.

† The references to legislation etc throughout this document are those generally applicable to England and Wales. For Northern Ireland the appropriate corresponding legislation etc should be applied in accordance with the alternative references given in Appendix 6.

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1.0 General

Scope

1.1 This memorandum is concerned with the importance of general fire precautions in healthcare premises. In particular, it draws attention to the key role of management in devising and implementing policies and programmes for dealing with the life-threatening situations presented by fire in an extremely vulnerable environment, and for ensuring that staff at all levels receive appropriate and regular training in fire safety and evacuation procedures. The trained staff referred to throughout this document are those **trained in fire safety procedures and practices appropriate to the workplace**, that is, they need not always be regarded as trained professional staff, such as registered nurses.

1.2 The important role of staff in fire prevention and in responding promptly and effectively in the event of a fire, is emphasised. It is stressed that prompt action is the most crucial element in saving lives and minimising damage to property.

1.3 Guidance is provided on the use and storage of flammable substances and the fire hazards of particular hospital departments. These matters are covered in greater detail in the appropriate Fire Practice Notes of Firecode.

Background

1.4 Few people have first-hand experience of a serious fire, yet all appreciate the threat it presents and the terror it brings when an outbreak becomes uncontrollable. This effect is heightened when patients are involved whose observation and mobility are impaired by illness or disability. A special responsibility therefore devolves on hospital management in relation to fire safety in their premises.

1.5 Statistics of fires occurring in hospitals must be treated with caution, as some fail to get reported. However, Home Office figures indicate that between 2000 and 3000 fires occur in UK hospitals each year, of which about half start in wards and in other patient care areas, and most are caused by the careless use and disposal of smokers' materials, by malicious fire-raising, and by faulty electrical equipment. For further details see Appendix 1.

1.6 A "life-threatening" fire is one which leads to casualties and rescue, or where evacuation is necessary. Fortunately, only a very small proportion of fires in hospitals falls into this category. Occasionally a very serious fire occurs such as that when 30 patients died at Coldharbour Hospital in 1972, and when seven patients died at Warlingham Park Hospital in 1982. The potential for serious fires of this sort indicates the need for adequate staffing in wards at night. The dangers of smoke logging resulting from the lack of provision or ineffective use of fire doors, and the use of non-flame-retardant bedding, contribute to the seriousness of a fire. Comparatively few very serious fires occur, however, and this is partly attributable to the vigilance, skill and fire safety training of the staff who work in those locations.

1.7 Apart from the risk to life, a serious fire disrupts treatment and damages property. While most hospital fires do not spread beyond the ward or room in which they start, the financial and organisational consequences from fire damage can be considerable, often costing many thousands of pounds, particularly if specialised equipment is involved. With its limited resources the National Health Service cannot afford the costs of fire damage, especially when so much still needs to be done to improve fire precautions in hospitals, particularly in the older stock.

1.8 The importance of structural fire protection is stressed in Firecode: HTM 81 – 'Fire precautions in new hospitals' (with Supplement 1), and in HTM 85 – 'Fire precautions in existing hospitals' (refer to Appendix 7). However, the success of this form of protection can only be effective after a fire has started. Equal, if not greater, attention should be paid to the prevention of fire and to the need for speedy and effective response to an outbreak. The provision of fire-retardant furniture, furnishings and textiles (see Firecode: HTM 87 – 'Textiles and furniture') is another important measure. These measures complement, but are not a substitute for, structural fire precautions.

1.9 The provision of adequate means of escape for patients and staff is a statutory requirement. Means of escape becomes crucial once a fire has taken hold. In the majority of hospital buildings the basic principle for escape in the event of fire, is that the occupants can always turn their backs to the fire and travel away from it directly by way of circulation spaces, other fire compartments, escape routes and stairways to a place of safety, if necessary outside the building. There is a requirement for alternative escape routes leading directly to a place of safety. The application of this principle of escape is embodied in the concept of progressive horizontal evacuation.

1.10 Fire safety in healthcare premises is the concern of all who work in the National Health Service. Everyone from the chief executive downwards has a responsibility to understand the characteristics of fire, smoke and toxic fumes, to know the fire hazards of their working environment, and to practise and promote fire safety and the need to react instinctively should fire occur. The unpredictability of human behaviour, particularly in an emergency, should be appreciated. Attention to fire safety will control the number of outbreaks, save lives and reduce the resources spent restoring fire-damaged buildings and equipment, thereby improving standards of patient care.

2.0 Fire safety policies and staffing levels

2.1 The contents of this chapter should be read in conjunction with the guidance contained in Firecode: 'Policy and principles', section 3.0 – "The management and organisation of fire precautions in NHS healthcare premises".

Fire precautions policies

2.2 General managers and chief executives are required to have clearly defined fire safety policies for all premises under their control. This will include a carefully prepared programme for dealing with fire prevention, fire-fighting and the movement or evacuation of patients in an emergency. The programme involves the implementation of physical precautionary measures to prevent the occurrence and spread of fires, and the provision of means for dealing with such outbreaks in accordance with statutory and Firecode requirements. The policies must also include the instruction and co-operation of every member of staff, professional and administrative, to ensure a clear understanding of their role in taking effective emergency action.

2.3 An essential ingredient of any fire safety policy is the preparation of an operational strategy for immediate implementation when a fire emergency arises. This must set the emergency procedures and is one of the most important features of a fire policy, and it must be familiar to all staff. Responsibility for drawing up and maintaining comprehensive fire precautions, safety policies and programmes of improvement rests principally with the senior management. They will be assisted by managers at each appropriate level, and hospital fire safety advisers appointed in accordance with the guidance in Firecode: 'Policy and principles', section 3.0.

2.4 Preparation of a fire safety policy requires teamwork because of the complexities of a hospital organisation and there must be a multidisciplinary approach to the consideration of proposals for particular premises. Managers and hospital fire safety advisers should consult with administrative, medical, nursing and estates experts when formulating or amending fire safety policies. The local fire authority may be consulted regarding fire emergency procedures.

2.5 Senior managers who delegate particular duties to supporting staff, should be informed regularly that the arrangements continue to be satisfactory. Difficulties and deficiencies must be brought to their notice without delay. It is important that policies and plans produced in accordance with the foregoing paragraphs are reviewed regularly so that physical changes in the hospital's structure, changes of function, procedures and other matters which have a bearing on fire safety, can be taken into account promptly.

2.6 The operational strategy for dealing with a fire emergency must be prepared to suit the circumstances of individual premises. For convenience, a checklist for assisting line managers to prepare a fire emergency procedure is included in Appendix 2.

Fire safety signs and notices

2.7 The Safety Signs Regulations 1980 control the display of safety signs. Reference should be made to HTM 65 – 'Signs guide 2: fire safety signs', HTM 54.1 – 'User manual', 1993, and to BS5499:Part 1: 'Specification for fire safety signs'.

2.8 Statutory (blue/white) fire prevention notices and fire action notices are required to ensure that the means of escape and fire precautions are maintained and used in the manner intended. Other notices and signs are required to supplement statutory provisions. Signs are standardised such that "prohibition" signs are displayed as white-on-red, "safety" signs as white-on-green, and "hazard" signs as black-on-yellow. At conspicuous positions in all parts of hospitals and other healthcare premises, statutory notices and signs must be displayed which state clearly and concisely the agreed main actions to be taken upon discovering a fire and on hearing the fire alarm. In addition, notices giving more detailed instruction about fire action must be displayed on notice-boards in staff rooms and staff residential accommodation. Local circumstances will determine whether statutory fire notices, safety signs and fire action notices must be multilingual. Where available, pictograms should be considered.

2.9 Escape routes and fire exits must be prominently indicated by means of the approved signs. It must be possible to read fire exit signs and notices during a period of electrical power failure. Staff must familiarise themselves with those appropriate to their workplace during their span of duty. They must also be familiar with the locations and instructions relating to first aid fire-fighting equipment and other equipment requiring action in the event of fire.

2.10 Management has a particular responsibility in respect of all staff, including agency, bank and other part-time staff, employed in patient care areas of hospitals. They must have an operational procedure which ensures that fire safety training is given to such staff **immediately** at their first attendance in an unfamiliar place of work, such as a ward or department. Staff must be shown the necessary fire alarm call points, the fire stations accommodating first aid fire-fighting appliances, the boundaries of the fire compartments, fire doors and escape routes, and be given an explanation of the evacuation strategy for the location.

2.11 An example of a fire action notice for display in all staff rooms, staff residential accommodation and on notice-boards is contained in Appendix 3.

Staffing levels

2.12 The presence of an adequate number of staff who have received specialised training in fire safety is the best first line of defence against fire. This is particularly important at night when levels of activity in a hospital may be reduced, staffing levels are lower, and detection of an outbreak of fire may be delayed. Trained staff must be able to respond promptly and effectively to any fire emergency and this is a vital factor in limiting the consequences of an outbreak where dependent patients are involved.

2.13 The medical and nursing needs of in-patients in a nursing management unit usually mean that a minimum of two staff are required to be on duty at all times. These staff must be trained in the methods of patient evacuation appropriate to the clinical dependency of those under their care. This number may need to be supplemented if the patients are highly dependent and to ensure that there are at least two trained people quickly available at all times, for example during meal breaks, to carry out evacuation procedures in the event of fire.

2.14 It is the responsibility of management to achieve an agreed safe level of staffing sufficient to deal with the consequences of a fire in its early stages. All staff, agency, bank or other part-time staff, must be trained in patient evacuation methods. Any who have not been trained must be under the direction of fully-trained staff. Unless other specific arrangements have been made, the senior nurse in the nursing management unit must be responsible for taking the initiative until relieved.

2.15 It should be noted that the fire safety recommendations of Firecode have been agreed with the Home Office Fire Services Inspectorate and are devised on the assumption that these requirements will be met. It is the responsibility of management to have an operational policy to ensure that in the event of fire, additional personnel may be mobilised rapidly to assist in the fire zone.

2.16 Where a health authority or trust has established one or more small premises located remotely from its main sites, perhaps accommodating a few patients under the care of a small number of nursing staff, it must have an operational policy which takes into account the circumstances of the location and satisfies both the requirements of this HTM and Firecode: 'Policy and principles', section 3.0.

2.17 In accordance with the requirements of Firecode: 'Policy and principles', section 3.0, it is essential that a nominated officer (fire) be appointed in hospital premises who is primarily responsible for ensuring that trained staff, in compliance with paragraph 2.13 above, will be available should an outbreak of fire occur at any time. The provision of specialist hospital fire safety advisers (refer to 'Policy and principles', section 3.0) is a matter which the health authority or trust must consider in the light of their particular circumstances. The Department of Health strongly recommends the appointment of competent hospital fire safety advisers to advise management and to report on the means of fulfilling existing and forthcoming statutory and Firecode obligations in all NHS premises.

Fire safety audits

2.18 Firecode: 'Policy and principles', section 3.0 requires that each chief executive/general manager must have for each of their premises a programme, prepared with the agreement of the local fire authority, for installing and satisfactorily maintaining an adequate level of fire precautions designed to prevent the occurrence, ensure the detection and warning, and to stop the spread of fires. This programme should also include procedures for raising the alarm in case of fire, for fire-fighting, and for the movement or evacuation of patients and staff in an emergency, and appropriate means for formally recording staff training in these matters.

2.19 Each chief executive/general manager is required to confirm annually that their management policies regarding fire safety comply with the provisions of 'Policy and principles', section 3.0 and Appendix 1.

The processes of a fire safety audit differ from those for risk assessment as required, for example, by the procedures of HTM 86 (refer to Appendix 7). Risk assessment firstly identifies fire hazards and the particular risks they present to the occupants of a premises. Following a thorough assessment of the risks, effective fire precautions are arranged to match the level of fire risk. A fire safety audit would verify that these fire precautions, once in place, are being maintained effectively.

2.20 To assist with this mandatory requirement, it is recommended that chief executives/general managers arrange for an annual audit of fire safety, covering all of their premises. The purpose of the audit is to monitor compliance with Firecode and other statutory requirements (Fire Precautions Act 1971 etc), to identify weaknesses in compliance, set up remedial programmes, and to allocate sufficient resources within the framework of their business plans. Local circumstances will dictate prioritisation of need.

2.21 Fire safety audits should examine and question all aspects of fire safety. They may be carried out either by competent staff employed by the health authority/trust or by external consultants. The audit should be systematic and cover all aspects of fire safety, including physical precautions, staffing arrangements and management systems. Where required, validation checks must be included in the audits. For example, documentary evidence supporting the fire precautions policy should be examined, the visual integrity of cavity barriers, fire stopping etc should be verified, and remedial actions set in train where necessary.

2.22 The fire audit team must have full access to the relevant staff, records, buildings and plant.

2.23 The following guidance points to particular aspects which should be covered by the audit:

- the acceptance of responsibilities set for fire safety as required by Firecode: 'Policy and principles', section 3.0, by the chief executive/general manager;
- written fire safety policies for all healthcare premises;
- nomination of an executive director having responsibility for fire safety;
- appointment of nominated officers (fire);
- appointment of hospital fire safety advisers;
- a rolling programme for installing and maintaining an adequate level of fire precautions for each of its healthcare premises, for inclusion in the annual business plans for each premises;
- a regular review and updating of fire safety policies and emergency procedures;
- risk assessments in accordance with HTM 86;
- a procedure for reporting serious fires, in accordance with Firecode: 'Policy and principles';
- training of staff in accordance with Firecode: 'Policy and principles', and HTM 83;
- procedures for alerting the fire brigade in the event of a fire in accordance with Firecode: HTM 82;
- regular testing and recording of the condition and effectiveness of fire alarm and detection systems and extinguishment systems;
- regular checking and recording of the condition of first aid fire-fighting equipment;
- regular checking of the effectiveness of escape lighting;
- the presence and validity of fire drawings, indicating means of escape, physical fire precautions etc;
- applications for obtaining fire certificates for premises designated under the Fire Precautions Act 1971;
- the procedure for issuing hot work permits, and the control and use of flammable materials, for example adhesives etc, within hospital premises;
- appropriate procedures for consultation with local fire and building control authorities;
- the correct procedure for the storage of flammable liquids (FPN 2);
- practice of evacuation techniques involving the use of escape bed lifts (provided in accordance with FPN 3);
- provisions for commercial premises (FPN 5);
- provisions for housing in the community (HTM 88);
- fire safety in staff residences (houses in multiple occupation);
- the registration of nursing homes and private hospitals in accordance with the Registered Homes Act 1984, Part 2;
- policies for purchasing flame-retardant textiles and furniture (HTM 87).

Competent persons

2.24 Paragraphs 2.17, 2.19 and 2.21 refer directly or indirectly to the use of a competent person. Wherever a competent person in respect of fire safety is recommended within a Firecode document, the following definition shall apply:

> **Competent person: a person recognised as having sufficient technical training and actual experience, or technical knowledge and other qualities both to understand fully the dangers involved, and to undertake properly the statutory and Firecode provisions referred to in this document.**

A competent person may be a person employed by the NHS or a person employed in an organisation appointed to undertake work on behalf of the NHS.

In proper fulfilment of duties, a competent person would be expected to have the necessary proficiency, inter alia:

- *with relevant laws, regulations and codes of practice etc, and their application to NHS premises;*
- *for liaising with other professional staff;*
- *for interpretation of technical drawings;*
- *with passive and active fire precautions;*
- *for assessing fire risks and applying effective counter-measures;*
- *with fire-fighting equipment and its continuing effectiveness;*
- *for organising, supervising and controlling the work of others.*

3.0 Fire prevention

General

3.1 The spread of fire can be limited by the incorporation of structural fire precautions and the use of flame-retardant textiles and furnishing materials. However, the likelihood of fires starting can be reduced significantly if suitable preventive measures are adopted. Good practice in fire prevention is largely a matter of awareness through training of the ways in which fires can start, and of the upkeep of orderliness and tidiness in day-to-day activities, that is, "good housekeeping". The nominated officer (fire) or an appointed deputy should undertake the responsibility of walking the patient care areas of hospital premises each day, to ensure that there is compliance with the guidance of this section.

3.2 Hospitals contain much flammable material, but they are not in general considered to constitute a high fire risk. Staff are always on duty and fire incidents are normally discovered quickly, enabling prompt action to be taken. In patient treatment and accommodation areas, for example, no time need be lost if suitable first aid fire-fighting equipment is provided and staff on duty know how to use it (if it is safe to do so).

3.3 Certain locations in a hospital, for example laboratories and pharmacies, medical gas stores, main kitchens, laundries, boiler houses, workshops, stores, and now shops in the foyer etc, carry higher fire risks and fire loads, and it is in such locations that fires may occur which can gain a hold and lead to considerable damage. These areas should be located separately, but where they are within or adjacent to areas to which patients or staff have regular access, they require special attention when structural fire precautions, fire alarm and detection facilities, and fire suppression measures are being planned.

Structural fire precautions: for new buildings see Firecode documents HTM 81 – 'Fire precautions in new hospitals' (with Supplement 1) and 'Nucleus Fire Precautions Recommendations'. For existing hospitals, refer to the new HTM 85 – 'Fire precautions in existing hospitals'. For all premises refer to HTM 82 – 'Alarm and detection systems' and HTM 87 – 'Textiles and furniture' (see Appendix 7).

3.4 Important aspects of fire prevention in hospitals include the need to recognise fire risks from smoking, the increasing possibility of arson, and the application of "good housekeeping" practices by all staff. These aspects are dealt with in more detail in the following paragraphs.

Smoking

3.5 Smoking has shown a marked decline in recent years; however, statistics show that a major cause of fires in hospitals is still from carelessness in the use and disposal of matches and smokers' materials.

3.6 A reduction in the number of fires caused through smoking is feasible if the following advice is strictly followed:

a. apply careful vigilance to ensure that smokers do not cause fires by the careless disposal of cigarettes and matches, or by falling asleep while smoking. Be aware that elderly people and those with mental illness may present a particularly high risk;

b. sufficient and suitably-placed ashtrays or bins of an approved type should be provided for the safe disposal of smokers' materials, where smoking is permitted;

c. day rooms and other places where smoking is permitted should be inspected at regular intervals during the day and periodically after they have been vacated for the night, to ensure that discarded smokers' materials have been removed and that they have not ignited other materials;

d. "smoking" and "no smoking" areas should be clearly marked by appropriate signs and displayed in mandatory or prohibition format where necessary. Smoking should be prohibited in main kitchens, stores, ceiling voids, ducts and basements, and in parts of buildings where there is combustible storage.

3.7 The clear aim should be to discourage and restrict smoking as far as practicable, and detailed guidance on promoting no smoking policies on NHS premises is contained in Health Service Guidelines (HSG) (92)41.

Arson

3.8 Arson, or wilful fire-raising, accounts for about 20 per cent of hospital fires, and this proportion is increasing. This form of malicious fire-raising is a particular hazard in hospitals for people with mental illness. However, the nature of the occupants means that they may not be fully aware of the consequences of their actions. At other hospitals, arsonists have set fire to premises without regard to the safety of the occupants.

Safety Action Bulletins SAB(88)79, November 1988 and SAB(89)80, October 1989, gave guidance about the safe storage, use and disposal of aerosol canisters.

3.9 The activities of arsonists can be frustrated by alertness on the part of staff to persons acting suspiciously, and to the activities of known fire-raisers amongst patients. Prompt removal of combustible rubbish, care in securing premises, particularly stores containing flammable materials, volatile fluids, aerosol canisters with flammable propellants etc, will reduce the risks from arson. The new Fire Practice Note 6 – 'Arson prevention and control in NHS healthcare premises' should be consulted.

Good housekeeping

3.10 Attention to "good housekeeping" practices can reduce the likelihood of fire. Some of the particular practices which should be observed are:

- avoidance of the use of highly flammable materials and liquids wherever practicable (see also Firecode: FPN 2 – 'Storage of flammable liquids');
- orderly methods of stacking in stores where linen, paper or plastic packaging are used, to reduce the risk of fire spread, and to assist fire-fighting;
- storage of equipment and packages in designated areas only – **not** in plantrooms, services voids and shafts, corridors or lobbies;
- regular checks to ensure that storage is **never** permitted in a hospital street or an escape route, near a fire exit or fire-fighting equipment;
- positively discouraging the drying of items over heaters having radiant heat sources which can lead to dangerously high temperatures and possible ignition;
- regular checks for the accumulation of rubbish in "out-of-sight" spaces such as lift wells, behind radiators, basements, dead-end corridors etc. Waste and unauthorised storage must be dealt with promptly;
- regular cleaning of workplaces, machinery and equipment spaces, and checks for the accumulation of fluff and grease deposits in laundries, main kitchens and similar areas;

- correct storage of cleaning rags and materials in non-combustible containers after use;
- when leaving places of work, checking for possible causes of fire, for example electrical equipment left on or plugged in (over 20 per cent of fires start in electrical equipment), gas appliances and other heating sources left on. Vulnerable doors and windows should be secured against intruders;
- when television viewing is concluded for the day, checking by staff that all TV equipment is switched off and unplugged from socket-outlets;
- removal of un-fused multiple point adaptors found in socket-outlets by estates department staff, and warning staff generally about their use;
- prohibition of unauthorised adjustment or repair to electrical equipment, and no use of official, unofficial, or private electrical equipment until it has been checked and approved by the appropriate technical staff. The connection of 13 amp plugs must be undertaken by technical staff;
- regular checking of electrical cables and cords for signs of wear, and the immediate withdrawal from service of any suspect electrical equipment, which must be reported to the officer responsible for electrical maintenance.

HTM 2007 – 'Electrical services: supply and distribution', gives comprehensive advice and guidance about the operation and maintenance of electrical systems in healthcare premises.

HTM 2020 – 'Electrical safety code for low voltage systems', provides guidance for compliance with the Electricity at Work Regulations 1989.

Combustible waste

3.11 The following paragraphs 3.12 to 3.23 relate only to the fire precautions aspects of waste and its disposal.

General principles

3.12 It should be the aim of unit managers to have a policy for the prompt disposal of waste from hospital activities accumulating over a 24-hour period. This will entail the provision of secure places of storage for waste awaiting disposal. It is expected that such receptacles as imperforate non-flammable or metallic bins, both types to be supplied with well-fitting lids, will be provided for this purpose. To deter arson, loaded receptacles should be taken away to designated secure places to await disposal, remote from patient care areas. Unattended waste should not be stored or left in underground tunnels, walkways and basement areas, on stairways or corridors. Escape routes must be kept clear at all times. Waste disposal chutes, where provided, should be maintained under constant supervision. Any redundant chutes which connect basement zones with floors above may constitute a serious fire and smoke risk and must be sealed off in the basement, and at each floor level, with fire- and smoke-resisting seals.

3.13 An efficient procedure must be established for the collection and disposal, or recycling, of combustible waste. Such waste might include, for example, packing cases, packaging materials, clinical and food packaging and other waste products left over from works activities etc. The continuing increase in the use of disposable items, many of which are of a combustible nature, emphasises the need for diligence and for prompt removal to designated places of storage and disposal.

Waste disposal and collection

3.14 Regular collection of waste material is essential, from wards and patient treatment areas and from designated holding points. Staff must be instructed, as part of their fire safety training, to place waste materials only in officially provided containers, and at designated collection points. Whenever practicable, at least one collection point should be provided for each department of a hospital.

3.15 Paper or plastic refuse sacks must be mounted on fixtures with self-closing lids, but these must not be located in corridors or escape routes. If located in a staff or patient care area, refuse sacks should be completely housed in a non-combustible container, for example a metal bin with a well-fitting, self-closing, metal lid, or in a fire-resisting enclosure.

3.16 A conspicuous and durable notice should be exhibited nearby, warning smokers against placing their spent materials in containers.

3.17 Arrangements must be made for the transfer of full sacks without delay to secure holding enclosures for further disposal on a regular basis, as needs demand.

3.18 Collection and storage spaces should be separate from occupied premises and sources of ignition in incinerating areas. If necessary, they should be enclosed by suitable fire-resisting construction where there are siting difficulties.

Ease of access, particularly to external areas

3.19 The free-access nature of many hospitals means that, in general, members of the public have relatively easy access to vulnerable parts of hospital complexes. The possibility of arson from intruders, disgruntled employees and others should be considered. Fire authorities have frequently drawn attention to the need for better procedures for controlling waste disposal and for restricting the unauthorised access to vulnerable parts of hospital premises.

3.20 Accumulation of waste material external to hospital premises can constitute a serious fire risk. Unattended waste is an attraction to potential arsonists. Reports of fires originating in piles of combustible waste in hospital grounds are common. These fires may spread to damage property, and smoke may activate adjacent automatic fire alarm systems and cause tension and irritation to patients and staff. Better control of access to areas having unattended waste and prompt disposal of waste will reduce these risks.

Safe disposal of flammable liquids

3.21 The safe storage of flammable liquids in healthcare premises is dealt with in Firecode: Fire Practice Note 2 which should be read in conjunction with Health and Safety series booklet HS(G) 51 'The storage of flammable liquids in containers'. The quantities of flammable and highly-flammable liquids kept in departments should be as small as is reasonably practicable for the day-to-day purposes of the department.

3.22 The safe disposal of unwanted small quantities of flammable or highly-flammable liquids should be entrusted to competent persons acting with the knowledge of the hospital fire safety adviser. It may be possible to achieve disposal by safely burning highly-flammable liquids in suitable shallow metal trays in the open air, at safe locations remote from buildings, flammable storage areas and drains. The opportunity might be taken to combine this activity with a staff training session in first aid fire-fighting. Highly-flammable liquids and many solutions and reagents used in pathology laboratories must never be disposed of down sinks, gulleys and drains, as this practice can cause explosions, injury and damage.

Incineration

3.23 Certain items, such as paraffin wax and spent aerosol canisters, are **not** suitable for disposal within incinerators because they can cause explosions and thereby jeopardise the safety of operators and equipment. Some aerosol canisters use flammable gases as propellants, and these can explode with great force. "Ozone-friendly" spraying substances are available, some in non-pressurised containers, and the use of these should be encouraged.

Aerosol containers

3.24 Advice on the handling of aerosol cans was given in Health Equipment Information No 76, January 1979. An extract is given below:

"HEALTH EQUIPMENT INFORMATION NO 76 – JANUARY 1979

20/79 Pressurised aerosol sprays: the safe disposal of empty cans and general safety precautions

Because of the continuing reports of accidents and problems in the disposal of pressurised aerosol cans, advice given in HEI No 17 (item 18/66) and 22 (item 44/67) on their storage, use and disposal is re-issued and amplified.

1. Hospital departments should hold only a number of cans required for immediate use. Additional quantities should be kept in a cool store, preferably one reserved for the storage of highly-flammable substances and having adequate low-level ventilation.

2. Cans should not be exposed to excessive heat, for example direct sunlight or radiators.

3. Cans should be handled and stored carefully to avoid damage.

4. Aerosols should not be sprayed near naked flames or other sources of ignition.

5. An aerosol can should not be operated when the can is inverted.

6. Manufacturers' warnings printed on the container must always be observed.

7. Under no circumstances may aerosol cans be disposed of by incineration – the resultant explosion may cause injury and considerable damage. Health authorities should ensure that users do not place empty cans in refuse bins, but keep them separately for eventual collection and disposal.

Further information on the safety precautions to minimise the fire/explosion risks associated with aerosol cans is available from the Fire Protection Association, 140 Aldersgate Street, London EC1A 4HX."

Storage of clinical waste

3.25 The following documents provide guidance on the storage of clinical waste:

- 'Safe disposal of clinical waste', – HMSO, ISBN 0 11 886355 X – issued by the Health Service Advisory Committee;
- DoE Waste Management Paper 25 (under review).

Underground premises

3.26 Fires in underground premises, or parts of premises, can go unnoticed and present a special hazard from the resulting build-up of smoke, toxic gases and heat, due to reduced ventilating facilities. Access and fire-fighting may be difficult.

3.27 The following fire precautions are applicable to underground or windowless premises:

a. flammable storage should be arranged in such a way that the fire-risk potential is minimised;

b. where possible, access should be arranged directly from the open air;

c. areas containing significant fire risks should be segregated by fire-resisting construction from the remainder of the premises, and be equipped with automatic fire detection or, where justified, with fixed fire-fighting equipment appropriate to the assessed risk;

d. designated means of escape must be provided for occupants and maintenance staff, and means of giving and receiving fire warnings must be provided, as a separate zone, off the main hospital fire alarm system;

If, in the case of a factory premises, explosive or highly-flammable materials (other than materials of such kind and in such quantity that the fire authority has determined that they do not constitute a serious additional risk to persons in case of fire) are stored or used in or under the premises, a fire certificate is required. The local fire authority should be consulted.

e. ventilation systems should be so arranged as to minimise the risk of their spreading fire, smoke and toxic fumes throughout the area or affecting other parts of the premises;

f. the local fire authority should be consulted as to the adequacy of smoke outlets and access for fire-fighting.

This information is also included in Firecode: HTM 81 – 'Fire precautions in new hospitals', paragraphs 11.15 and 11.16. Guidance on underground car parks is provided in HTM 81, section 12.

Textile materials

3.28 Advice on the use of fire-resistant textile materials in healthcare premises is given in Firecode: HTM 87 – 'Textiles and furniture'.

Lightning and its characteristics

3.29 Lightning is the manifestation of the high-energy discharge which occurs following a natural build-up of electrical charges in storm clouds. In the UK there are about one million flashes to the ground in every decade. Activity varies across the country. More flashes occur in the east than in the west, and more occur in the south than in the north. In accordance with this pattern, statistical data shows that the yearly average of ground flashes ranges from 0.1 to 0.6 per square km. The figure varies by 2:1 in step with the 11-year sunspot cycle.

The possible consequences from a lightning strike

3.30 A ground strike produces a series of effects summarised mainly as electrical, mechanical and thermal. A further effect is that of side-flashing.

3.31 Lightning can cause injury and death in four ways:

a. by directly striking a person, causing serious burns and death due to termination of various main physiological functions;

b. from fire and/or structural damage to premises, causing masonry etc to collapse;

c. from side-flashing;

d. from sudden large voltage gradients.

3.32 Buildings struck by lightning often catch fire suddenly, especially if they are inadequately or not protected by a lightning system. The resulting fire and smoke can lead to injury of persons, including asphyxiation and death. The damaged structure of the building may be so unsafe as to fall, causing further injury or death.

3.33 The phenomenon of internal side-flashing between metallic parts of structures can cause fire and damage. This may occur due to the absence of a protective system, or one that is faulty through incorrect routing of protective conductors, and from high impedance joints in an existing, badly-maintained system.

The protection of structures against lightning

3.34 The protection of structures against lightning is a specialist subject which is beyond the scope of Firecode. It is fully covered in BS6651:1992 'Code of practice for protection of structures against lightning'. The BS provides excellent background on important principles and practice, the need for protection, and on how to assess the risk of a strike, and makes technical recommendations about specific types of premises. It also provides an appendix giving guidance on the protection of electronic equipment against failure from lightning strikes. This topic may need to be addressed in respect of the installation and reliability of fire alarm systems provided to accord with Firecode: HTM 82.

3.35 Designers, estates staff and hospital fire safety advisers must be aware of the fire and other consequences when lightning strikes a building. By referring to BS6651, they must consider the need for, and the extent of, a lightning protection system which, once installed, must be maintained in an effective state throughout the life of a building. Reference should also be made to HTM 2007 – 'Electrical services: supply and distribution'. The design and installation of an effective system must be entrusted to a company specialising in this type of work.

4.0 Fire-fighting equipment

Fire-fighting equipment for use by staff

4.1 Different classes of fire are defined in BS4547. The following is a brief summary:

a. class A fires involve solid materials, usually of an organic nature, in which combustion normally takes place with the formation of glowing embers;

b. class B fires involve flammable liquids, oils, greases and fats;

c. class C fires involve gases;

d. class D fires involve burning metals.

It is essential that the provision and use of first aid fire-fighting equipment is suitable for the fire risk involved. In most parts of the hospital, particularly patient care areas, the fire is likely to be class A, and water will be the most practicable extinguishing medium available. Appendix 4 gives guidance on the selection of extinguishers and their use.

Fire-fighting equipment using halon

4.2 The two halons generally used for fire-fighting are Halon 1211 and Halon 1301:

a. **Halon 1211** is predominantly used in portable fire extinguishers but is also used in fixed systems;

b. **Halon 1301** is used in fixed local and total flooding systems, although a few portable extinguishers have been imported.

4.3 The continuing manufacture of halon is now controlled by the terms of the Montreal Protocol and its periodic revisions. The 1992 revision agreed to phase out the production of all halons by 1 January 1994, with exemptions allowed for "essential uses".

4.4 The ending of halon production should not have any major implications for fire-fighting within the NHS as, in most instances, equipment using existing alternative extinguishing agents will provide adequate protection.

4.5 The most common use of halons is in portable extinguishers (Halon 1211). Although the Montreal Protocol does not restrict the sale or use of halon extinguishers, nearly all manufacturers of portable extinguishers have responded to widespread public concern and international government pressures over the use of ozone-depleting substances and have stopped, or intend to stop, the production of halon-filled extinguishers.

4.6 Halon portable extinguishers should not now be considered for new provision in healthcare premises. Adequate existing alternatives are available in the form of carbon dioxide, foam, dry powder and water, or a combination of one or more of these (see Appendix 4).

Existing halon extinguishers in healthcare premises

4.7 Replacement of existing Halon 1211 hand-held extinguishers, which have an average life of about ten years, is unnecessary before the expiry date of the extinguishers. When replacement is due, they should be disposed of in a responsible manner and not discarded as refuse. Disposal should be in compliance with sections 33 and 34 of the Environmental Protection Act 1990. Manufacturers should be approached and, whenever possible, use should be made of their recovery facilities for halon extinguishers, where they exist. However, with the passage of time, this opportunity will almost certainly cease to exist. The facility may be free or at nominal cost; halon from fixed systems (type 1301) taken out of service should be returned to manufacturers who are allowed to pool reclaimed halon such that it may be recycled for "essential uses", pending future international agreement for its suitable replacement by approved gaseous fire-fighting substances. The respective suppliers should be consulted for guidance at the appropriate time.

4.8 BS6535:Part 2.2 gives guidance on the correct procedure for the decanting and handling of halons. Companies offering a recycling service should state in writing that they can comply fully with the requirements of the British Standard. Health service staff should not undertake this procedure.

4.9 While there is no need for the immediate replacement of halon extinguishers, it is important that the discharging of halon is strictly controlled. Consequently, all non-fire discharging, either for staff training or testing, **must** stop immediately. Local guidance material must be amended to ensure that the discharge of halon for non-fire-fighting purposes cannot occur.

Total and partial flooding systems

4.10 Total and partial flooding systems which use Halon 1301 are not common within the NHS, but a few will exist in locations such as electrical sub-stations, computer suites, or other rooms containing important electrical or diagnostic equipment.

4.11 Fixed systems should be replaced at the end of their service life, that is, between 10 and 20 years subject to use. There are presently no "drop-in" replacements for Halon 1301. The existing alternatives (CO_2 and water) require completely new installations in accordance with BS5306:Parts 0 to 7. Where halon flooding systems are installed, the only course of action available is to reduce halon emission to the minimum by eliminating all discharge testing and accidental discharges. Alternative methods of pressure testing which do not involve the discharge of halon exist, and advice should be sought from fire equipment suppliers.

4.12 New total or partial flooding systems should not be provided except where a "critical use" may exist. Acceptable criteria for "critical use" would be that:

a. the fire hazard and the nature of the risk justifies fire protection; and

b. no acceptable fire protection strategy is available; and

c. the use of substitute fire extinguishants would pose an immediate threat to the life of the occupants in the protected facility; and

d. the loss of the facility would pose an immediate threat to life and/or severely impair the running of the hospital.

New computer and electronic applications are not generally regarded as a critical use, and NHS Estates should be advised of all locations where halon is being considered under "critical use" criteria.

5.0 Fire safety training for all staff in healthcare premises

General

5.1 The management and organisation of fire precautions, including staff training, is dealt with in section 3.0 of Firecode: 'Policy and principles'. Efficient application of fire safety procedures is subject to staff knowing what to do. NHS directly-managed units and trust hospitals are required under the provisions of Firecode to provide effective training in fire prevention and in how to respond to an outbreak of fire. This applies to all staff without exception. Senior medical and managerial staff must lead by example. This requirement is of vital importance, and it is the duty of senior managers of all disciplines to ensure that their staff have both basic instruction in fire safety, and training appropriate to the specific needs of their workplace. Every member of staff in premises providing healthcare for the NHS must:

a. understand the character of fire, smoke and toxic fumes;

b. know the fire hazards involved in the working environment;

c. practise and promote fire prevention;

d. know instinctively the right action to take if fire breaks out, or smoke is detected;

e. be familiar with the evacuation procedures and escape routes appropriate to their location at their time of duty.

Training requirements

5.2 Fire, with smoke and toxic fumes, can develop rapidly and cause confusion and panic. Training should emphasise the need for quick and disciplined responses when an outbreak of fire is discovered. Basic fire safety procedures must be included in all induction training for new staff at their first attendance at a workplace, whenever there is a change of staff, or in the risks in case of fire at a location. They must understand the action required of them in the event of fire, that is:

Firecode: HTM 82 – 'Alarm and detection systems' sets specific responsibilities for communication with the fire brigade.

a. raise the alarm, inform the main telephone switchboard and request assistance;

b. remove patients (and others) in immediate danger to a place of safety;

c. fight the fire, if it is safe to do so, with approved appliances;

d. evacuate the area in accordance with the emergency evacuation plan;

e. close all doors, windows, hatches etc to prevent further spread of fire, smoke and toxic fumes.

5.3 An effective fire-safety training policy will enable staff to learn about and practise basic actions and appreciate the wider implications of the fire safety strategy, including:

*Fire doors which need to be held open for the efficient running of a unit may be held open by automatic hold-open devices which **release the door** on the activation of the fire alarm system.*

- the reasons for fire and smoke compartmentation of buildings, and for protected escape routes to the open air;
- the importance of ensuring that the intended functions of fire/smoke doors are not prejudiced by the **dangerous practice** of wedging them in the open position;

- the dangers of locking fire exit doors – **no fire exit door on any escape route to be secured by means of keys**;
- the requirement for a clear procedure for allowing contractors to work within hospital premises;
- the need to be familiar with escape routes, with site layout, with the internal layout of the premises in which they work and in which they reside, and to recognise the need to keep escape routes free of obstruction and rubbish;
- the potentially fatal consequences of the spread of fire, smoke and toxic gases;
- the fire hazards of their local environment and the need for vigilance;
- how to recognise signs of fire;
- how to raise the alarm, initiate communication with the fire brigade, and how to activate local procedures for dealing with a fire;
- in general, when and how to undertake first aid fire-fighting, where appliances are located, which appliance to use and how it should be operated and used (reminder: all but the smallest fires should be left to the fire brigade);
- the circumstances in which patients (and others) should be removed to a place of safety and how evacuation should be carried out.

*Fire exit doors **must** afford immediate means of escape. There are a number of proprietary methods of maintaining means of escape while providing security from external access. Fire exit doors with special mechanical and break-glass devices must be continuously alarmed to deter unauthorised use. BS5725:Part 1 provides standards for "panic" bolts and latches.*

5.4 Additional training must be provided to meet the special needs of particular locations, and for staff who have special responsibilities. Examples are:

- nursing staff, and any others who may have to assist, should receive instruction and training in appropriate methods of evacuation, that is, techniques for moving and assisting patients (and others) to evacuate quickly in an emergency. The special problems of moving patients from an ITU and similar locations, where highly-dependent people are cared for, must be well rehearsed;
- telephone switchboard operators must be instructed and trained in the actions they must take in the event of fire in the hospital, that is, communicating with the fire brigade in accordance with guidance in Firecode: HTM 82;
- estates staff must have precise instructions for dealing with the safe control and isolation of services such as gas, water, electricity, ventilation, piped medical gases etc, which they may need to control during a fire. (This applies also to staff in hospital main kitchens, for example.)

5.5 All staff, including part-time and agency staff, must attend a local fire-safety training course to include the first aid fire-fighting and emergency evacuation procedures appropriate to their actual place of work. This training should take place immediately on appointment, be for at least one hour, and preferably should be repeated at least once more in their first period of 12 months, and thereafter once annually. Training for staff on night duty is particularly important in view of the reduced level of staffing which applies at that time. To comply with fire safety regulations in designated premises such as offices, shops and factories (or hospital premises undertaking a "factory process"), staff must receive instruction or training in what to do in case of fire.

5.6 Consideration should be given to the establishment of a fire training unit for the purpose of training staff in fire safety procedures. Where it can be justified, this should be within the boundary of a health authority or trust premises. It may be economic to consider such a facility for a large hospital site, where it is to be expected that a fire training unit should be under the care of the hospital fire safety

adviser. The unit would provide those parts of fire safety training which it is impracticable to undertake at a work location, to supplement the latter.

Trainers

5.7 Firecode: 'Policy and principles' requires general managers and chief executives to appoint staff with specific roles in fire safety. The primary responsibility for ensuring that there is an effective policy for training **all** staff in fire safety procedures rests with an executive director assisted by a nominated officer (fire), who should receive suitable training prior to assuming their duties. A suitable course for this purpose is available at Eastwood Park NHS Training and Conference Centre at Falfield, Gloucestershire.

5.8 The specialised fire safety training of staff will be under the care of specialist hospital fire safety advisers, who must decide what knowledge and skills are required by staff to implement the fire emergency evacuation plan agreed for the premises, to apply routine fire prevention measures, and to undertake first aid fire-fighting. Together, these officers must define the standards of performance to be achieved by staff in meeting the requirements of the hospital's fire safety policy, while retaining compatibility with day-to-day operational functions. Priorities need to be identified and standards set which are capable of satisfactory completion within a realistic timescale.

Recording and assessing training programmes

5.9 To achieve the necessary standards of all-round competence, the training programme should include practical sessions and fire drills to supplement classroom instruction. It is essential that training sessions are well publicised and that arrangements are made in good time for the release of staff. Records must be kept of staff attending instruction, the dates and duration of the instruction, the nature of training given, and names of those attending and those instructing, in order to identify staff needs for training and to verify training should the need arise.

5.10 Assessing the effectiveness of training schemes is important but often difficult to carry out with certainty. Nominated officers (fire), in conjunction with hospital fire safety advisers, should from time to time devise methods of testing staff. It is likely that the practical performance of staff at training will offer the best indication of a programme's effectiveness and the degree to which staff have assimilated instruction. The recording system must enable the nominated officers (fire) to oversee training programmes effectively and check that training targets have been met, including those for part-time, agency and night-duty staff.

5.11 The hospital fire safety adviser, or an assistant, is responsible for the detailed recording of staff attendance at training sessions and their performance. In certificated premises (Fire Precautions Act 1971), training records should be held in the premises to which the fire certificate and the training relates. It is recommended that this practice is extended to all parts of a healthcare premises. Consideration should be given to discussing attendance at fire safety courses at each annual round of staff appraisals.

Fire drills

5.12 The effectiveness of emergency plans for dealing with a fire and of various aspects of fire safety training must be tested by means of practical fire drills, preferably by both day and night. The frequency and organisation of such exercises is a matter for local management in association with the local fire authority, but it is recommended that they take place at least once a year and simulate conditions in which at least one of the escape routes is deemed to be obstructed by fire or smoke. Where there is a high turnover of staff, drills may need to be carried out more frequently. The progress of drills should be monitored by specially-nominated, competent staff. Records must be kept giving details of the drills and their outcome. During these drills the fire alarm must be operated by a member of staff who is told of the supposed outbreak, and thereafter the fire routine must be rehearsed as fully as circumstances allow. Drills should not endanger those taking part.

The fire brigade must be alerted beforehand to the precise timing of the alarm call so that a true fire is not overlooked.

5.13 A further drill should be carried out as soon as practicable afterwards if the previous drill has revealed serious problems, if there are appreciable changes in the staff employed, or if there has been any building work or change to the premises which affects the means of escape.

5.14 In this HTM, section 3 deals with the various aspects of fire prevention, and section 6 deals with the action to be taken in the event of fire. They are not intended as an exhaustive list for training purposes but they may assist those concerned with fire safety training.

6.0 How to respond to an outbreak of fire

6.1 The prime responsibility for dealing with a serious outbreak of fire rests with the fire brigade, who are trained to take prompt and effective action. The fire brigade must be called immediately a fire is detected or suspected, however small it may appear. The first few minutes are crucial in the development of a fire but **staff should not attempt to fight a fire unless it is safe to do so**. Specific recommendations for arranging communication between hospitals and fire brigades are given in Firecode: HTM 82 – 'Alarm and detection systems'.

Signs of fire

6.2 The presence of fire may be indicated by smells of burning, crackling and related fire noises, and smoke seepage etc. A closed door, even one that is not hot to the touch, may have a fire on the other side. Where it is suspected that there is a fire on the other side of the door, the door should **not** be opened as this will allow the fire to spread rapidly and may also cause the person opening the door to receive serious burns.

6.3 The longer a fire remains undetected the greater the probability that it will become a major life-threatening event, causing severe damage and disruption to services. Vigilance and prompt action at all times will ensure early detection, the immediate raising of the alarm and, if safe, effective first aid fire-fighting.

Immediate actions required

6.4 The immediate steps to be taken when an outbreak of fire is discovered are as indicated in paragraph 5.2 and Appendix 3.

6.5 **Raising the alarm** is a vital first step in order that help can be obtained from trained staff and the fire brigade. The main telephone switchboard must be alerted to carry out detailed procedures for calling the fire brigade (see Firecode: HTM 82 – 'Alarm and detection systems').

6.6 When fire is discovered, staff should primarily be concerned with the safety and welfare of patients and others in the vicinity. The second step to be taken is to **remove any patients** in the vicinity of the outbreak to an intermediate place of safety in adjoining compartments or sub-compartments which are fire-free, in accordance with the pre-arranged policy of progressive horizontal evacuation.

6.7 The concept of progressive horizontal evacuation is to move patients in stages away from the site of a fire. This will involve moving them initially to an adjoining fire compartment or sub-compartment on the same level which has been designed to protect its occupants from the **immediate** dangers of fire and its associated effects. The patients from the evacuated area **may** be able to remain there until the fire is dealt with. If the fire progresses and further movement of patients away from the area of fire becomes necessary, they can be moved to the next adjoining safe area providing refuge, leading ultimately to a final exit by the process of evacuation down available protected stairways or escape bed lifts, the latter provided in accordance with Firecode: FPN 3 – 'Escape bed lifts'. This procedure will give sufficient time for non-ambulant and partially-ambulant patients to be taken down to a place of safety, should it become necessary to evacuate an entire storey.

6.8 All escape routes must lead to a final exit providing access to a place of safety, that is, the open air free from the effects of fire and smoke. There will be particular difficulties in evacuating highly-dependent or confused patients along corridors and down stairways. Some methods that can be adopted are illustrated in Firecode: HTM 81 – 'Fire precautions in new hospitals', section 7.

6.9 When all patients that are at risk have been removed from the immediate vicinity of a fire, all doors to the affected room or area must be shut to contain and delay the spread of flames, smoke and toxic fumes. This action may reduce the supply of oxygen to the fire and thus help to control its spread.

6.10 Some common sense is required in applying these principles. In the case of a very minor fire, for example a cigarette smouldering in a waste-paper basket, prompt action with a hand-operated fire extinguisher may control the outbreak immediately without the necessity of undue disturbance to patients. However, this does not preclude the first step of raising the alarm since, if prompt fire-fighting action does not prove effective, any delay in notification could have fatal consequences.

6.11 As stated in paragraph 6.1, **staff should only tackle a fire if it is safe to do so**. Most small fires can be easily extinguished if attacked as soon as they start with suitable first aid fire-fighting equipment in the hands of trained staff. (See Appendix 4 for details of fire-fighting equipment and the types of fire for which they are intended.) Fires in electrical equipment or installations should not be tackled before the electrical supply has been switched off, preferably at a point closest to the equipment involved.

6.12 Persons fighting a fire should always place themselves between the fire and the nearest means of escape. If there is any doubt about personal safety, if a fire becomes too difficult to fight or it cannot be contained, it should be abandoned and left to the fire brigade.

Dangers from smoke

6.13 A high proportion of fires in hospitals originates in wards and involves textiles and furnishings. In many fires, smoke and toxic gases present far greater hazards than flames. Most deaths result from smoke asphyxiation and inhalation of hot toxic fumes. Smoke and toxic fumes can spread very rapidly. They obscure vision, affect breathing and mental and physical reactions. They can kill patients and staff who are some distance away from the seat of the fire. Man-made materials without flame-retardancy properties used in furniture, furnishings and textiles are particularly hazardous because, if ignited, they produce large quantities of hot, dense black smoke with toxic fumes which will quickly interfere with evacuation and fire-fighting. Firecode: HTM 87 – 'Textiles and furniture' deals with less harmful materials now available.

Fire action notices, fire safety signs, and other fire notices

6.14 Refer to paragraphs 2.7, 2.8 and Appendices 2 and 3.

7.0 Fire hazards in hospitals and associated precautions

7.1 In section 3, reference was made to certain hospital locations which may carry higher fire risks and therefore require special attention when fire precautions are being planned. This section considers these locations and their associated services in more detail.

See also Firecode: FPN 4.

Main kitchens

7.2 Kitchens are classified as presenting a high fire risk, and a fire occurring in a kitchen may result in serious and potentially long-term disruption to the catering services, with an immediate effect on patients and staff. Equipment may be costly to replace.

7.3 Outbreaks of fire in kitchens are mainly from overheated and poorly-maintained fat-fryers, faulty electrical or gas appliances and direct contact with naked flame. With the introduction of cook-chill services, existing electrical circuits must be adequate to cope with electrical demand where the reheating of several containers may take place simultaneously. This is to prevent overheating of electrical circuits. Similar care is necessary when re-heating takes place in patient care areas.

7.4 Spontaneous combustion has been known to occur at very high temperatures in frying equipment, especially when it has been left unattended, or due to temperature thermostats which have been incorrectly set or are faulty. Fat-fryer fires which arise in this way are particularly fierce, with rapid spread of fire and smoke.

7.5 When oils or fats are heated above certain temperatures (see Table 1 below) a flammable vapour is formed which can be readily ignited, for example by the burners – more particularly by the naked flames of gas jets. Such ignition can be terminated only by rapid lowering of the temperature or the exclusion of oxygen for combustion. The large amount of oil or fat contained in many fat-fryers is capable of supporting a fire for a period long enough to cause considerable damage and to generate much smoke. For safe operation, therefore, the temperature or cooking media must be held at levels below their respective flash points (see Table 1 below). This is best achieved by the use of reliable, automatically-operating overriding thermostats. Even so, adequate and suitable means of extinguishing a fire must be available close to every fryer, for example at the least, an appropriate fire blanket with a foam AFFF or FFFP fire extinguisher (see Appendix 4). Staff must be given training in the correct use of foam extinguishers.

	Smoke point		Flash point		Fire point	
	°C	(°F)	°C	(°F)	°C	(°F)
Groundnut oil	202	(395)	250	(482)	335	(635)
Corn oil	199	(390)	243	(469)	321	(610)
Lard	205	(400)	275	(527)	326	(619)
Dripping	154	(310)	246	(475)	331	(628)
Hydrogenated cooking fats	190	(375)	228	(442)	331	(628)

Table 1 Approximate critical temperatures for various cooking oils and fats

Notes:

a. normal frying temperatures fall within the range of 163°C–188°C (325°F–370°F). Overheating degrades the oil or fat, causing it to darken, thicken, foam and develop an "off" flavour;
b. smoke point is measured in accordance with BS684 Section 1.8. The temperatures quoted refer to use while cooking; for fresh fats and oils heated alone, smoke points may be some 30°C (50°F) lower;
c. flash point is the lowest temperature at which vapours can be ignited in a specific test method. Although combustion is not maintained at this temperature, there is still a danger of explosion and/or fire. Fire point is the lowest temperature at which self-supporting combustion can be maintained under test conditions;
d. auto-ignition (spontaneous ignition) temperature is that at which vapours ignite in a heated vessel without an ignition source being present. Auto-ignition temperatures are greater than the respective flash points but do not correlate directly with fire points;
e. the temperatures quoted in the table refer to oils and fats heated in the pan alone. While cooking is in progress, flash points tend to be raised slightly due to steam in the vapour. On the other hand, flash points can be reduced markedly when oils and fats become degraded or contaminated;
f. in general, any temperature higher than the respective smoke points should be regarded as potentially hazardous.

7.6 Appropriate first aid fire-fighting equipment must be provided throughout the kitchen area. The selection and specification of such equipment should take account of the kitchen environment and the particular hazards associated with kitchen fires on particular appliances. (Refer also to Appendix 4.)

7.7 Fire blankets in accordance with Appendix 4 should be provided at convenient points and all kitchen staff should be instructed in their use by the hospital fire safety adviser. It is essential to apply the correct techniques when dealing with fat-fryer fires. Fish-fryers have lids which may be lowered initially to smother a fire. Under no circumstances should water be used to extinguish, or allowed to come into contact with, fat fires. Consideration should be given to the use of self-extinguishing systems for deep fat-fryers (see Firecode: FPN 4 – 'Hospital main kitchens').

7.8 New kitchen staff should be trained in fire safety and be familiar with the location of fire-fighting appliances. It is important that all catering staff receive proper instruction on the correct method of operating fat-fryers safely as detailed below.

Correct use of fat-fryers

7.9 Oil or fat should be maintained at correct levels. Overfilling increases splashing when food is lowered into the fat, and low oil or fat levels may prevent the thermostat from working correctly and seriously increase the risk of overheating and fire.

7.10 Heating sources supplying pans should never be left operating when used oil or fat is being drained from the pans.

7.11 Care is required when solid fat is introduced into empty pans. Until a sufficient quantity of fat has melted to cover the sensitive elements of thermostats, these devices may remain ineffective.

7.12 If the type of cooking fat or oil is changed, the new cooking medium may have a different flash point from that previously used. Estates staff should be informed when a change is made so that thermostat settings can be checked. Oils and fats of different types should not be mixed.

7.13 A high standard of regular and effective maintenance is essential to reduce fire risk. The most reliable apparatus will fail eventually if it is not regularly inspected and overhauled, and if the controls are not correctly adjusted. Incidents have occurred where deep fat-fryers have caught fire when cooking oil has leaked from faulty pans onto the gas burners below, destroying the gas valves and associated control equipment.

7.14 Correct functioning of both the normal controlling and the overriding thermostats is extremely important. Operating temperatures should be checked, as should diaphragms of relay valves, which can stiffen with age and fail to shut off gas supplies.

7.15 Routine cleaning is essential, with particular attention being given to the removal of fatty deposits from the hob and surrounding metalwork, the hood, sides and back of the fryer, internal surfaces of ductwork, fan blades and any filters.

Cleaning practices

Fibreglass construction is unsuitable because of the possibility of excessive release of smoke in the event of fire, and distortion and destruction of the hood.

7.16 Hoods should be constructed of sheet metal with smooth surfaces which can be easily cleaned.

7.17 Equipment, working surfaces and structural parts must be maintained at a high standard of cleanliness. Care should be taken in the use of cleaning materials, which must not be allowed to come into contact with food products.

7.18 General refuse and discarded packaging must not be allowed to pile up in the kitchen or to restrict escape routes.

7.19 Sacks of rubbish must not be left near the kitchen overnight unless they are in a secure holding area.

See also Firecode: FPN 1 – 'Laundries'.

Laundries

7.20 Laundries are classified as being a high fire risk. Most serious laundry fires occur during "silent" hours when staff are not present to raise the alarm. Because of the high capital value of laundry plant and equipment and the critical importance of the laundry service, an automatic fire protection system is regarded as essential, except perhaps in very small laundrettes and existing laundries nearing the end of their economic life.

7.21 The selection and specification of fire detection equipment should take account of the laundry environment and the particular hazards associated with laundry fires. For instance, a large proportion of laundry fires originates in smouldering linen, and the early detection of smoke by means of smoke detectors is

essential. This will lead to the prompt attendance of fire-fighters, and avoid a major conflagration.

7.22 Laundries suffer from this form of spontaneous combustion which is caused by a build-up of heat at the centre of bulk loads of hot linen, through the slow oxidation of the textile fabric within the load. Very little smoke or heat may be produced for some time, perhaps a few hours, but eventually the material bursts into flame.

7.23 The risk of spontaneous combustion is increased when hot work is taken straight from a tumble dryer or calender and tightly packed in trolleys or trucks. The presence of residues of oil, grease, wax, soap, rubber or similar materials on the fabric will further increase the danger.

7.24 Tumble-dried work has been a major cause of fires due to spontaneous combustion, and special attention must be paid to the following operating procedures:

a. work should not be over-dried in the tumbler;

b. work should not be left in the tumbler after the drying process is finished, but should be unloaded immediately;

c. tumblers must always be unloaded and left in an empty state overnight;

d. tumble-dried work should be separated and folded as soon as possible after removal from the tumbler. If this cannot be done, the work should be removed from the tumbler and spread out in such a way that the heat is quickly lost;

e. ideally, tumblers should be equipped with manual, or preferably automatic, means for cooling the load at the end of the drying cycle.

7.25 NHS laundries must have instructions for employees, displayed in appropriate positions, on the safe operation of tumble dryers and the handling of dried loads to reduce the potential for fire.

Where tumble dryers are installed within the common services areas of nurses' residential accommodation and other comparable locations, similar instructions must be displayed.

7.26 Fluff collects in laundries and, if ignited, will result in the rapid spread of fire. Fluff should not be allowed to accumulate. Regular cleaning of the more accessible places in a laundry must also include the removal of fluff from electric motors, heating coils, tumbler ducts and roof trusses.

7.27 The minute textile fibres comprising such fluff or lint are prone to spontaneous ignition when impregnated with oil, wax or other greasy residues, particularly if adjacent to sources of heat. The areas under calender beds, and around the operating mechanisms of cabinet garment finishing machines, are particular points of danger.

Radioactive substances and registration procedures

7.28 Section 104 of the Environmental Protection Act 1990 (EPA90) removed Crown exemption from NHS hospitals in respect of registration under Section 1 of the Radioactive Substances Act 1960 (RSA60) for the keeping and use of radioactive material. The holding and use of radioactive material in NHS hospitals was originally controlled by a long-standing administrative agreement between what is now Her Majesty's Inspectorate of Pollution (HMIP) and the Department of Health. From 1 January 1991, when S.104 of EPA 90 came into operation, all NHS hospitals are required to formally register under S.1 of RSA60, and they should have approached the relevant regional HMIP office to obtain the necessary application forms.

7.29 There are a number of departments within hospitals which may use radioactive substances, for example radiotherapy, nuclear medicine, radiology, oncology, pathology and pharmacy. Other departments may use radioactive substances for research projects in associated facilities. Radioactive substances are normally kept in storage facilities, refrigerators, safes etc which can be locked. It is expected that this and the general protection afforded by the construction of these departments will provide effective barriers against fire. Provided that appropriate steps are taken to eliminate the use of flammable materials within rooms, the risk of a fire should be low.

7.30 The use of radioactive substances will be embodied within local rules which must indicate general principles and describe the means for complying with the Ionising Radiations Regulations 1985. These rules must contain contingency plans for any reasonably foreseeable incident and should include any risks associated with an outbreak of fire.

7.31 Local fire authorities should be made aware of the normal locations of radioactive sources in hospitals and the general nature and activity of the sources involved. Suitable mandatory notices will indicate the presence of radioactive sources and electrically-powered units which generate radiation, for example X-ray units. The latter would not be considered as risks in fire situations because they would be isolated from their mains power at the incidence of a fire. It is important, therefore, to identify those locations where there may be genuine risks from radioactive sources at the time of a fire.

7.32 The local fire authority must be kept informed of new or changed practices by means of periodic reviews to maintain the effectiveness of agreed fire emergency procedures. Fire brigade personnel will normally be equipped with suitable monitors and protective clothing to safeguard them against anticipated risks, but the need for any further provisions must be considered at time of review. Any protective equipment used at a fire must be monitored after use for the presence of radioactive contamination and then dealt with in accordance with agreed procedures. Nominated officers (fire) should ensure that suitably qualified hospital personnel are available to give authoritative advice at times of review and fire emergency.

7.33 During a fire emergency it may be necessary to evacuate patients who are undergoing treatment or diagnosis by means of radioactive substances. Care must be taken to avoid injury to these patients while they are being handled, or to other patients, due to the presence of a radioactive substance. Special arrangements must be considered for patients undergoing such therapy and the need to segregate them from other patients and staff, particularly those who are pregnant, during an evacuation process. These special requirements should have been examined beforehand and form part of the pre-arranged evacuation strategy.

Ionisation smoke detectors

Radiation levels, safe storage and disposal

7.34 Some types of smoke detector used in automatic fire detection and alarm systems contain radioactive materials. Radiation levels for each type of detector, their storage and safe disposal after recovery, are controlled by legislation. Appendix 5 to this HTM provides guidance on this subject.

X-ray film storage

7.35 X-ray film produced in this country has a cellulose acetate base and is classified "non-flam", although it will burn slowly. Prior to 1941, film made of cellulose nitrate was available. This type of film is highly flammable and explosive at slightly raised temperatures. However, the need to retain such film will be reducing every year and storage for small amounts only should now be required.

7.36 "Non-flam" film has a similar degree of fire risk to products made from paper, and steel cabinets are considered to be the most suitable containers for storage. Naked lights and other igniting agents should not be permitted in the storage area.

7.37 If film is not to deteriorate in storage, the storeroom temperature should not fall below approximately 10°C (50°F) and low-temperature type heating should be used. Electric heaters should be of an enclosed convector type installed at a high level and controlled by a room thermostat.

7.38 Cellulose nitrate film, where retention is still required, should be stored in totally enclosed metal containers having tight-fitting lids and conspicuously marked "Highly Flammable" in red lettering. Stocks exceeding 35 kg (80 lb) should be stored in a room of fire-resisting construction of minimum one hour, and which is reserved exclusively for this purpose. It must be well ventilated directly to the outer air. The store should preferably be located remotely from healthcare buildings, when its fire resistance may be reduced to half an hour. It should be kept cool because nitrate film can decompose after lengthy storage, particularly in a warm temperature. The door to the store must be permanently and conspicuously marked "Film store – No Smoking".

Physiotherapy departments

7.39 Fires have been attributed to the overheating of physiotherapy wax baths, which have been left switched on overnight to reduce "warming up" time the next day. A time-switch may be used to control the power to socket-outlets supplying wax baths. Timing devices must be regularly checked to ensure that the settings are still correct.

7.40 Because of the highly flammable nature of wax, thermal safety devices must form part of these appliances. A thermostat to control the temperature over a range considered safe for the patient (maximum 50°C) is required, with a manually resetting type provided which is pre-set to trip at a safe temperature (60°C maximum). This will ensure that no overheating occurs when the bath is empty or partly filled. The temperature limits of control are determined by patient safety as well as fire risk. Operating temperature range should be 45–50°C. Overheating will occur at 55–60°C. Automatic detection should be considered where it is normal practice to leave electrical equipment in unattended use.

7.41 The sterilizing of physiotherapy wax by heat can constitute a serious fire risk unless carried out in suitable non-combustible surroundings under proper supervision. Suitable fire extinguishing apparatus should be at hand, for example a 10 litre (2 gallon) foam (type AFFF or FFFP) or a 4.5 kg (10 lb) powder-type extinguisher. Staff must be trained in the use of foam extinguishers.

Magnetic resonance diagnostic equipment

7.42 The Department of Health document 'Guidelines for Magnetic Resonance Equipment in Clinical Use' covers important aspects of magnetic resonance diagnostic equipment in clinical use, with particular reference to safety of personnel who may need to enter the room(s) concerned at the time of fire. It is recommended that nominated officers (fire) and the specialist hospital fire safety advisers are fully familiar with the contents of this document.

7.43 Strong magnetic fields are generated by magnetic resonance diagnostic equipment and are located within a designated "controlled area". Access to the controlled area is restricted to authorised personnel. Unauthorised personnel, including unauthorised staff, must be medically screened before entering the controlled area. The strong magnetic field within the controlled area can affect the operation of heart pacemakers, and cause a projectile effect on ferromagnetic materials.

7.44 Within the controlled area an inner controlled area may be defined where the magnetic field strength is even stronger. Before entering the inner controlled area all personnel must take the following precautions:

a. they must deposit mechanical watches, credit cards, magnetic tapes and ferromagnetic objects at the reception area;

b. they must remove from their clothing all ferromagnetic objects such as pins, scissors, keys, tools, hair grips, certain spectacles that have ferromagnetic parts, etc;

c. ferromagnetic objects such as tools, gas cylinders, trolleys etc must not be taken into the inner controlled area. Non-ferrous fire extinguishers to special order are obtainable from a major UK manufacturer.

7.45 These restrictions on access to the controlled area have implications for fire safety.

7.46 Fire safety procedures which specifically address the problems associated with controlled access must be prepared in advance in association with:

a. the "responsible person" who has the day-to-day responsibility for magnetic resonance, as delegated by the general manager/chief executive;

b. the hospital fire safety advisers;

c. the local fire authority.

7.47 The fire safety procedure must consider the effects of a fire in areas adjacent to rooms accommodating the magnetic resonance equipment, specifically to establish a "shut-down" procedure which will make the equipment safe and allow unauthorised personnel safe access into the controlled area. An authorised person who can take responsibility for the controlled area must be available 24 hours a day to assist the fire brigade should a fire emergency occur.

7.48 The types of magnet systems associated with magnetic resonance equipment and their characteristics are listed below:

a. **resistive magnet systems:** in the event of a fire affecting a magnetic resonance diagnostic unit containing a resistive magnet, electric power should be isolated immediately and the unit evacuated. When the power is isolated, unauthorised personnel may enter if necessary;

b. **permanent magnet systems:** the field associated with a permanent magnet cannot be switched off. The fringe field is very low compared to other magnets, up to a distance of one metre from the magnet. Nearer than this the

field strength increases rapidly, giving rise to intense forces on ferromagnetic materials. A prominent warning notice should be placed at the entrance to the controlled area and on the magnet to the effect that the field is permanently energised;

c. **superconducting magnet systems:** these involve the use of liquid helium. With these systems the magnet must be quenched before it is safe for the emergency services to enter the inner controlled area with ferromagnetic material. Prominent warning notices must be provided. Quenching involves the boiling off of large quantities of helium, and must only be carried out by suitably trained and authorised personnel.

7.49 The cost and specialist nature of this equipment may be such as to justify the installation of a permanent automatically operated fire-extinguishing system. This may be in the form of sprinklers, a carbon dioxide flooding system or, very exceptionally, a halon flooding system (refer to paragraphs 4.2 to 4.12). Before such a decision is made, the manufacturer of the equipment should be consulted to establish which extinguishing agents are best suited to the characteristics of the equipment.

Laboratories

7.50 Pathology laboratories are classified as high fire risk. Most fires in laboratories arise from accidents with highly flammable substances. Advice on the storage of such substances is given in FPN 2 – 'Storage of flammable liquids'. Advice on the safe disposal of flammable liquids is given in paragraph 3.21 of this memorandum.

7.51 Oxidising agents such as perchloric acid require particular care. Although most of these agents are not flammable, they will oxidise many materials with which they come into contact, particularly following spillage or leakage, and greatly increase the risk of fire or explosion. The hazards of perchloric acid are dealt with in DS164/75 and HN(76)95 (in Wales, DSW164/75 and WHN(76)87).

7.52 Explosions are also possible if flammable solvents or specimens treated with such solvents are stored in domestic-type refrigerators, since accumulations of flammable vapour can be exploded by the normal operation of the electrical circuit. If it is necessary to store such solvents and treated specimens in refrigerated conditions, a refrigerator designed specifically for the purpose should be used.

Unattended apparatus

7.53 Special precautions are necessary where equipment is left connected to the supply during non-working hours, particularly where such equipment incorporates heating facilities with a possibility of over-heating. In these circumstances, a pre-set thermal cut-out should be provided in addition to the normal thermostatic control. Automatic fire detectors should be considered for rooms where it is normal practice to leave electrical equipment in unattended use.

Fire appliances and hazard signs

7.54 It is essential that in laboratory areas, conveniently sited hand-operated first aid fire-fighting equipment is available. Powder and carbon dioxide extinguishers are considered to be the most suitable for laboratories.

7.55 In laboratories handling categories A, B1 and B2 materials, which may be highly contagious, the laboratory doors must show an international bio-hazard sign. In addition, doors on equipment and specimen cupboards must have labels marked "Danger of Infection".

7.56 Nominated officers (fire) or, where appropriate, hospital fire safety advisers, must inform local fire brigades of special hazards associated with these departments. In the event of a fire, the hospital fire safety adviser, an assistant or any other responsible person in the department, should be contacted urgently for advice.

Electronic data processing equipment

7.57 A fire in an electronic data processing (EDP) installation can lead to extensive asset losses and serious business interruption. However, the occurrence of a major fire is a rare event, and provided there are persons on the premises, minor incidents involving EDP equipment can normally be dealt with by isolating the electric power to the unit in question. For this reason frequent "backing-up" of data should occur and duplicates of data files should be stored away from the EDP room. Insurance companies often quote the greatest risk as that from losing the databases, rather than the equipment itself.

7.58 Modern electronic equipment constitutes a relatively low fire hazard; accordingly, any protection philosophy directed solely towards a fire originating within EDP equipment is defective. Fires often originate outside the confines of EDP installations, typically from electrical faults, arson and smoking.

7.59 The infrequent occurrence of serious fires in large EDP installations does not obviate the need for high standards of fire protection. There are three levels of protection:

a. **equipment protection:** protection of EDP equipment from the effects of fire by automatic detection and/or extinguishment located within EDP cabinets;

b. **room protection:** protection of EDP equipment from the effects of fire by automatic detection and extinguishment by equipment located in the room;

c. **building protection:** protection of the premises that houses the EDP installation.

7.60 Generally, fire protection measures are installed to prevent financial loss, directly or indirectly (that is, through business disruption), and serious disruption to an important service. The degree of fire protection should be commensurate with the potential for such losses.

7.61 An equipment protection system is unlikely to be adequate for room or building protection, as it is not intended to deal with fires other than those in EDP equipment. A room protection system is likely to be inadequate for equipment protection, and can only offer building protection if it is highly reliable in operation, and is effective throughout all areas of the building that houses the EDP installation. A building protection system will not normally operate at an early enough stage to provide equipment protection, and may not be adequate for room protection.

*Although BS6266:1992 recommends the use of halon fire extinguishment, generally this is **not** recommended now for new installations within the NHS in view of the international agreements stemming from the Montreal Protocol.*

7.62 BS6266:1992 – 'Code of practice for fire protection for electronic data processing installations' provides detailed guidance on the protection from fire of EDP installations. It applies specifically to new installations but its recommendations may also be used as a guide to the adequacy of precautions in existing installations.

Commercial enterprises on hospital premises

See also Firecode: FPN 5.

7.63 Commercial enterprises, particularly shops established in hospital foyers etc, may present unacceptable fire risks. Small shop units in hospitals have been commonplace for a number of years. Recently, much larger complexes have been installed principally, but not exclusively, within the main entrances of hospitals. Income generation units other than shops, such as leisure and business facilities, may also be considered as additional attractive commercial undertakings. Such arrangements, and the variety of options to which suitable hospital locations may be put, are rapidly increasing.

7.64 The introduction of such high fire risk and high fire loading of the form described was not foreseen when Firecode was prepared originally. There is now concern that these enterprises may seriously affect the fire safety of existing patient care areas in hospitals by subverting the previously established fire safety criteria. Before they become involved with such schemes, hospital managers should consider their effect on patient safety, irrespective of whether the hospital complies with current Firecode guidance or the Home Office 'Draft Guide to Fire Precautions in Hospitals'.

7.65 Joint action by the Department of Health and the Home Office Fire Service Inspectorate established the need for further guidance, which resulted in Firecode: Fire Practice Note 5 – 'Commercial enterprises on hospital premises' (1992).

7.66 This FPN must feature prominently in discussions at the inception of all projects of this nature. Failure to apply its recommendations will lead to wasteful delays when schemes are submitted for approval, as a necessary prerequisite to the eventual issue of a fire certificate by the local fire authority.

Fire certificates

Required under the Fire Precautions Act 1971 (as amended by the Fire Safety and Safety of Places of Sport Act 1987).

7.67 Offices and shops, as defined by the Offices, Shops and Railway Premises Act 1963, and factories, as defined by the Factories Act 1961, may require a fire certificate which is issued by the local fire authority. Although hospitals are not designated under the Fire Precautions Act 1971, certain premises or parts of premises within a hospital are subject to designation as offices, shops and factories, and an application by the occupier must be made for a fire certificate using Home Office Form FP1(Rev)1993 – 'Application for a fire certificate'.

7.68 The requirement for a fire certificate with respect to designated premises depends upon the number of persons employed on certain functions and their location within the designated premises.

7.69 Briefly, a fire certificate may be required if:

a. more than 20 persons are at work at any one time;

b. more than 10 persons are at work elsewhere than on the ground floor;

c. there are two or more designated premises in a building and the aggregate number of persons employed therein exceeds 20, or 10 elsewhere than on the ground floor;

d. there are factory premises, irrespective of the number of persons employed, in or under which explosives or highly flammable materials are used or stored.

7.70 The following Home Office publications contain further guidance on fire safety in designated parts of hospital premises:

a. 'Guide to fire precautions in existing places of work that require a fire certificate: factories, offices, shops, and railway premises';

b. 'Code of practice for precautions in factories, offices, shops and railway premises not required to have a fire certificate'.

These documents must be consulted for guidance on fire safety in designated parts of healthcare premises.

7.71 The following list provides examples of locations within a hospital where an application must be made for the issue of a fire certificate:

- commercial enterprises (particularly shops);
- central sterile supply departments;
- theatre sterile supply units;
- manufacturing pharmaceutical departments;
- processing areas of medical photographic departments;
- pathology laboratories;
- hospital sterilizing and disinfecting units;
- laundries (including their boilerhouses)
- boilerhouses;
- hospital and ambulance maintenance workshops;
- electrical sub-stations (including standby generators);
- radiotherapy shielding workshops (manufacturing);
- radiological departments (recovery units);
- renal units (maintenance and refurbishment);
- workshops in psychiatric and other hospitals (industrial therapy);
- central processing kitchens for supplying hospitals (cook/freeze meal production).

7.72 Where the aggregate number of persons at work in designated parts of patient care premises exceeds 20, or 10 elsewhere than on the ground floor, any office accommodation associated with the patient care areas may be designated and may require a fire certificate. However, the means of escape and other fire precautions should be provided in accordance with Firecode: HTM 85 – 'Fire precautions in existing hospitals', not the guidance in the Home Office publication 'Guide to fire precautions in existing places of work that require a fire certificate: factories, offices, shops, and railway premises'.

7.73 The local fire authority is responsible for determining which premises are undertaking a "factory" process and they should be consulted.

Management of domestic services

7.74 Cleaning policies and procedures should take account of any relevant factors involving high fire risk, for instance the presence of dust, grease, etc on walls and internal surfaces of equipment which will aid the spread of flame and production of smoke. Contracts for cleaning services between health authorities and commercial undertakings should contain clauses to ensure that contractors will comply with relevant statutory fire safety and Firecode provisions as a prerequisite to obtaining a contract.

7.75 Ventilation hoods above deep fat-fryers are particularly prone to fire because of the accumulation of fatty material. It is recommended that main kitchens and kitchen equipment should be subject to a periodic "deep clean". The need to avoid an accumulation of rubbish is referred to earlier in paragraphs 3.10 and 3.14 to 3.18.

7.76 Documents which are of some relevance to fire precautions are DSM Advice Notes 1 (Cleaning frequencies in acute and general hospitals) and 3 (General guide to the management of domestic services in the NHS).

Estates departments

7.77 Works areas of estates departments are classified as high fire risk. Close co-operation between works staff and hospital fire safety advisers is necessary so that the latter have advance notice of maintenance and other work to be undertaken, particularly if hazardous processes are to be used. If outside contractors are to be employed, this is particularly important where "hot work" or flammable processes may be involved; the need for additional temporary fire safety measures to protect adjacent patient care areas should be considered.

Fire hazards during building operations

7.78 Premises undergoing alteration and extension, repair or maintenance, and those under construction, are particularly vulnerable to fire, often from lapses in safety precautions. Some contributory factors are:

- structural fire and smoke barriers such as walls, doors, floors, fire protective finishes which may be perforated, or ceilings which may be incomplete or temporarily removed. Where necessary, steps should be taken to maintain fire integrity by means of alternative arrangements;
- accumulation of flammable rubbish such as surplus packing materials, wood shavings and sawdust. Some building operations also generate fine dust particles which may become explosive, or potentially explosive, under certain conditions;
- unauthorised and dangerous storage and use of combustible building materials which may constitute a temporary high fire load in locations adjacent to and forming part of inhabited patient care areas;
- potentially dangerous processes and techniques during welding, the use of flame-producing equipment, flammable liquids, adhesives, etc;
- when fire detection and alarm equipment, and fire-fighting equipment, has not been fully installed or commissioned;
- obstruction of existing escape routes by construction materials and equipment.

7.79 A significant number of fires occur as a result of the activities of contractors. Outside contractors present a greater fire risk than NHS staff because they are not as familiar with the premises as people permanently employed there. They cannot be expected to appreciate the fire risks, the necessary precautions, and what action to take in the event of fire. Contractors may have to undertake work which may be more hazardous than that normally carried out on the premises. Every effort should be made to ensure that contractors are aware of the particular risks of working in a hospital environment. The use of "permit-to-work" systems and "hot work permits" etc is essential to define the extent of agreed access arrangements, any limitations upon activities and stipulations about fire safety.

Where building work is being carried out in occupied premises, patients, staff and visitors may be put at risk by a fire originating in the area, or in adjoining locations. Staff should be warned by the hospital fire safety adviser of the increased fire and security hazards if remedial physical action is impracticable, and instructed accordingly of any additional requirements.

At the completion of construction work etc, new and existing fire resisting structures should be closely inspected to ensure that full floor-to-ceiling and roof fire integrity, with the correct use of approved fire-stopping materials around penetrating services, has been achieved.

7.80 The site activities of contractors should be strictly supervised and controlled, even during small works and sporadic maintenance visits etc. Estates staff must ensure that all necessary precautions against fire are taken. The hospital fire safety adviser should give guidance and keep in regular contact with such activities to check compliance with the local fire safety policy.

7.81 The Department of the Environment booklet 'Standard Fire Precautions for Contractors Engaged on Crown Works' (ISBN 0-11-752523-5, available from HMSO) is a useful checklist of fire precautions which contractors should observe.

Building maintenance

7.82 Fire-protected areas, corridors, service voids, maintenance walkways and other areas which provide means of escape must be carefully maintained so as to provide the required resistance to fire, smoke and toxic fumes.

7.83 Fire doors should comply with the required rating for fire and smoke resistance. Ill-fitting windows, doors etc should be adjusted to prevent the admission of air currents which could feed a fire and spread smoke.

7.84 Fire hazards can be introduced by painted finishes, decorative features and wall displays. This is particularly so in the case of walls and timber surfaces in old hospitals which over time may have accumulated many layers of oil-bound paint. Oil-bound paints are flammable, and thinners, stripping liquids and cellulose paints often contain highly volatile and flammable ingredients. Blowlamps and heat guns used for paint stripping may cause smouldering fires in inaccessible places.

7.85 Painting processes may introduce hazards. Decanting of paint, thinners and stripping liquids must not be carried out near to naked sources of ignition. Caps and lids should be replaced on all containers when not in use. Only sufficient quantities of paint for a day's work should be drawn from store. Tins (including empties) should be returned to store at the end of each day. During paint stripping, deposits of stripped material must be collected at the end of each day and disposed of safely. Rags which have become impregnated with paint, thinners, stripping liquids, linseed oil etc should be collected daily and placed in a non-flammable container with a lid, pending safe disposal, and these should be removed from the premises at the end of each working day.

7.86 Care should be taken during painting work in the vicinity of pipes carrying flammable liquids or gases. Aluminium-based paints should not be used. Thermite can be evolved by the combination of iron oxides (rust) and aluminium powder, and this can be ignited by a spark from a spanner dropping onto a hard surface or by gas cylinders being knocked together.

7.87 When blowlamps are used in painting operations, or any other maintenance work, craftsmen must be taught to observe the following precautions:

a. never leave a lighted blowlamp unattended;

b. check that flames from blowlamps do not reach surrounding combustible material, particularly in roof spaces and inaccessible places, such as eaves and within the framework of sash windows. Recheck before leaving the premises, and ensure that there is no evidence of smouldering behind woodwork;

c. avoid using a blowlamp near curtains or drapes which might be blown onto the flame and ignite;

d. ensure that any burning paint strippings are immediately extinguished;

e. have suitable first aid fire-fighting equipment available to extinguish any fire which might be started.

The use of a heat gun in preference to a blowlamp should be considered a safer option.

7.88 After maintenance work has been carried out, care should be taken to restore the building elements to their former position and/or condition. Suspended ceiling sections and access covers should be replaced properly. Failure to observe these practices could result in smoke and toxic gases being freely released into escape routes via ducts or voids. Work on pipes and ducts should include the restitution of fire-stopping materials or dampers. The spread of flame characteristics of surface finishes should not be reduced as a result of maintenance work.

The guidance given in paragraphs 7.77 and 7.78 is equally applicable here.

Engineering maintenance

7.89 Engineering maintenance should be in accordance with good practice, and planned maintenance schemes should be applied as necessary for the various items of plant encountered on hospital premises. Any engineering services associated with fixed fire-fighting systems require particular attention.

7.90 Advice on the maintenance of fire alarm systems is contained in Firecode: HTM 82 – 'Alarm and detection systems', section 12. Records of maintenance done, and tests carried out, must be kept at each premises.

7.91 Fire-fighting equipment should be maintained on a planned basis in accordance with the advice given by fire equipment manufacturers. Records of maintenance done and tests carried out must be kept at each premises.

7.92 Ventilation shafts, smoke hoods, fire/smoke control dampers (where fitted) and mechanical extract systems such as roof louvres or shutters and fusible link systems, should be inspected regularly and tested for correct functioning; records should be kept. This is particularly important where they are designed to keep an area free of smoke for evacuation purposes in the event of fire, or for venting of fire, smoke and toxic gases after a fire.

7.93 Control and isolating equipment for engineering installations, that is, gas, water and electricity, piped medical gases etc, must be clearly labelled as to the zones supplied and must be readily accessible to competent staff at all times. Wherever practicable, service zones should be made conterminous with fire compartmentation zones.

Maintenance – general

7.94 Dirt, rubbish and unauthorised storage, all of which can accumulate in service ducts, voids, roof and plant equipment spaces, present a serious fire hazard. These spaces must be inspected regularly and kept clean. Disused ducts, services voids, rubbish chutes etc should be sealed up if possible, but ventilated as and where this is necessary.

7.95 Particular care should be taken when using liquefied petroleum gas (LPG) appliances for maintenance purposes in corridors, passageways and assembly areas. Where such corridors etc are part of an escape route, adequate arrangements should be made to preserve the integrity of the means of escape.

The guidance given in paragraphs 7.77 and 7.78 is equally applicable here.

Electrical services

7.96 Some 20 per cent of hospital fires involve electrical equipment and wiring. Electrical installations must be maintained in accordance with good practice, and planned maintenance schemes should be applied as necessary. Electrical engineering services associated with fire detection and alarm systems and fixed fire-fighting systems require particular attention. Periodic testing and servicing of electrical installations must include electrical resistance and earth continuity tests as prescribed in the Regulations for the Electrical Equipment of Buildings published by the Institution of Electrical Engineers (identical to BS7671:1992).

7.97 Where electrically-heated appliances such as film processing units, incubators and drying rooms are liable to be kept switched on while premises are unoccupied, a manual reset thermal cut-out should be provided in addition to the control thermostat.

The guidance given in paragraphs 7.77 and 7.78 is equally applicable here.

7.98 Temporary wiring is potentially dangerous and should be avoided where possible. Where its use is justified, it should comply with the Institution of Electrical Engineers Regulations for the Electrical Equipment of Buildings (identical to BS7671:1992). Permanent wiring must be used for installations which will be required for more than three months.

7.99 Switchrooms should be free from storage of items other than electrical components which may be required in an emergency. Fire precautions for electrical sub-stations and switchrooms and for transformer chambers are included in HTM 2007 – 'Electrical services: supply and distribution'.

7.100 Battery rooms should have adequate permanent ventilation direct to the outer air and a prominent "No Smoking" notice displayed. Naked flames must not be brought near batteries, particularly while they are being charged. The safety arrangements must relate to the type of battery installed.

7.101 Improvised arrangements made during power failures can increase fire risk. The provision of emergency electrical supplies is dealt with in HTM 2011 – 'Emergency electrical services'. In those parts of hospitals in which emergency lighting is not installed, portable battery-operated lanterns should be provided. The integrity of escape lighting is of particular importance.

8.0 Use and storage of flammable substances

8.1 This section provides general guidance on the use and storage of flammable substances on healthcare premises.

8.2 Confusion can arise when applying the terms "flammable" and "inflammable" when describing products in common use. These words are synonymous and to avoid possible confusion authorities concerned with fire safety recommend that "flammable" is used in all cases. This advice has been followed in this memorandum.

Storage of flammable substances

8.3 Flammable liquids and other flammable substances, particularly foam plastics and rubber, should be stored in a special enclosure reserved for the purpose. Advice on storage procedures is obtainable from the local fire brigade and the Health and Safety Executive. Detailed guidance on flammable liquids is contained in Firecode: FPN 2 – 'Storage of flammable liquids', and in Health and Safety Guidance (HSG) 51 – 'The storage of flammable liquids in containers'. Anti-static precautions should be observed.

8.4 Storage shelves and other fixtures should be constructed of non-combustible materials and storage facilities should be commensurate with the fire risk. If large quantities of flammable liquids are involved, storage in a secure enclosure in the open air is preferable to indoor storage.

Flammable liquids

8.5 Flammable liquids give off vapour which, under certain conditions, can ignite and/or explode. Many fires are caused by the misuse, or careless use, of such liquids and particular care is necessary in their handling and storage.

8.6 Quantities of flammable liquids sufficient only for immediate use should be kept in hospital departments. Additional supplies should be held in a suitably protected, cool, ventilated store. Containers should be sealed or capped immediately after use and should not be left standing in direct sunlight or where they may be knocked over. This applies particularly to volatile liquids in common use such as methanol.

8.7 Flammable liquids should not come into uncontrolled contact with open flame equipment or hot surfaces.

8.8 Space heating in laboratories by open flame methods and exposed incandescent elements must not occur because of the likely presence of flammable vapour. Work involving the use and release of highly-flammable liquids and gaseous vapours must be carried out in fume cupboards or fluid-pouring cabinets, and in accordance with safety procedures.

The guidance given in paragraphs 7.77 and 7.78 is equally applicable to the activities of paragraphs 8.10 to 8.12.

8.9 The use of flammable anaesthetics in hospitals is decreasing rapidly, but there is a risk from electrostatic sparking in areas where flammable anaesthetic agents are still in use. This matter and the associated anti-static precautionary measures are dealt with in 'Report of a working party to review the anti-static requirements for anaesthetic areas' (1990, Department of Health) and Health Technical Memoranda 1 and 2.

8.10 Care should be taken in the use and bulk storage of liquids for domestic cleaning and office use, for example floor cleaners, adhesives, floor sealers and correction fluids. When flammable adhesives are used in laying floor coverings, smoking should be prohibited and naked lights (for example gas pilot lights and fires which can ignite flammable vapours) should not be used in the immediate vicinity or in adjacent rooms and corridors. All windows in the room and doors which communicate with the open air should be opened wide, and warning signs posted. Surplus or discarded flammable liquids must not be poured down drains, toilets etc.

8.11 Ignition sources should be prohibited in rooms and below the room or area where work involving flammable adhesives is being carried out, because vapours are heavier than air and may penetrate into ducts etc or through some floors. The smallest quantity of adhesive necessary for immediate purposes should be brought into the room or building. These precautions should continue until the floor covering is completed and evaporation from the adhesive has ceased. Similar precautions are also necessary during the application of flammable floor sealers.

8.12 Doors leading to stores containing flammable materials should be kept locked when not in use and suitable signs displayed. "No smoking" rules should be rigorously enforced. Naked flames are the greatest and most likely hazard where oils are in use. The use of welding equipment, blowtorches etc should be carefully controlled in the vicinity of flammable liquids.

8.13 Aerosol sprays require careful handling because they may contain a flammable agent and, if the spray comes into contact with a naked flame etc, a "flame-thrower" effect can result. Smoking during paint spraying must not occur. Advice on the use, storage and disposal of aerosol cans is contained in paragraphs 3.23 and 3.24.

8.14 The risks associated with cooking oils are dealt with in paragraph 7.5, and those associated with paint, thinners and painting processes in paragraphs 7.84 to 7.88.

8.15 Fires resulting from dangerous practices and involving fatalities have occurred in staff residences. The use of volatile fluids for cleaning purposes in the presence of naked flames or incandescent heaters, or as a means of assisting an open fire to light, must not occur.

8.16 Petrol is a dangerous substance. It should be used only as a vehicle fuel and must never be used as a cleaning agent. When it is proposed to use and store petrol, the local authority and the Petroleum Regulations should be consulted. Other flammable liquids such as methylated spirits and white spirit, while having a legitimate use as cleaning agents, should nevertheless be used with care and kept away from open flames, gas and electric fires.

8.17 Clothing which has come into contact with a flammable liquid is a particular hazard and can be ignited by smokers' materials or through close proximity to a gas or electric fire appliance. Discarded swabs containing volatile liquids should be disposed of in accordance with the correct procedures and not in such a way that discarded smokers' materials can ignite them in waste receptacles etc.

Medical gases

8.18 Specific guidance on fire precautions relating to medical gases is given in several parts of HTM 2022 – 'Medical gas pipeline systems' (in preparation). "Design considerations", in section 2, deals with general principles and, in section 17, with the accommodation for medical gas cylinders, manifolds, compressors, vacuum pumps and pressure swing adsorber plant. "Operational management", in section 6, deals with cylinder storage and handling. Guidance is also available from the gas supplier and any specific recommendations should be followed.

8.19 Fire can occur when the following three elements are present at the same time: flammable materials; an oxidising atmosphere; means for ignition.

8.20 Flammable materials should not be present in cylinder stores, manifold rooms or liquid oxygen compounds; however, it may not be be possible to avoid the presence of flammable materials in the vicinity of the patient when medical gases are being used. Flammable materials which may be found near patients include some nail varnish removers, oil-based lubricants, skin lotions, cosmetic tissues, clothing, bed linen, rubber and plastic articles, alcohols, acetone, certain disinfectants and skin-preparation solutions.

8.21 An oxygen-enriched atmosphere may be present when medical oxygen or nitrous oxide/oxygen mixtures are used; nitrous oxide also supports combustion.

8.22 Ignition sources are numerous and include:

- open flames, burning tobacco and cigarettes, sparks and electrical sparks (including those which may be produced by some children's toys), high frequency, short wave and laser equipment, arcing and excessive temperatures in electrical equipment such as hair-dryers;
- cardiac defibrillator discharge;
- static electricity.

8.23 A mixture of breathing gases will support combustion. In an oxygen- or nitrous oxide-enriched atmosphere, materials not normally considered to be flammable may become flammable; flammable materials ignite and burn more vigorously. Clothing may become saturated with oxygen or nitrous oxide, and become an increased fire risk; when returned to normal ambient air, clothing takes about five minutes to be free of the gas enrichment. Blankets and similar articles should be turned over several times in normal ambient air following suspected oxygen enrichment.

8.24 Oil and grease, even in minute quantities, are liable to ignite spontaneously in the presence of high-pressure oxygen or nitrous oxide; no oil or grease should be used in any part of the medical gas pipeline system. In particular, oil-based lubricants should not be used and all fittings, pipes etc should be supplied degreased, sealed and labelled for medical gas pipeline systems. Details of these requirements are given in HTM 2022 "Design considerations".

8.25 The flammable anaesthetic agents such as cyclopropane and ether are very rarely used; cyclopropane is being phased out but a few cylinders are still in use. Where flammable agents are used, special precautions should be taken to minimise the risk of fire or explosion. Detailed advice is given in HTM 1 and BS5724:Part 1.

8.26 The siting and general structural principles for the design of liquid oxygen storage accommodation are stated in HTM 2022, "Design considerations", section 10, and for plantrooms and gas manifold rooms in section 17. Cylinder storage should be as recommended in "Operational management", section 6. The

following paragraphs indicate the general precautions which must be taken to minimise the risk of fire and explosion in accommodation of this kind.

Restriction on use of storage accommodation

8.27 Main stocks of oxygen, nitrous oxide, medical compressed air and other medical gas cylinders should be stored in the designated cylinder store as recommended in HTM 2022, "Operational management", section 6; no other materials should be kept in the store.

8.28 Cylinders should be stored in racks to BS1719 and used in rotation as received. As cylinders are emptied and taken out of use, heavy-duty tie-on labels, clearly marked "EMPTY", should be attached to empty cylinders. Empty cylinders should be stored separately from the full cylinders. Manifold rooms may be used for limited storage of cylinders only to the extent indicated within this document. Detailed procedures for cylinder storage and handling are given in HTM 2022, "Operational management", section 6.

Notices

8.29 Smoking, welding, all work producing sparks, and naked lights, are prohibited within or near the manifold room, plantroom and liquid oxygen compound area and the cylinder store. This prohibition also applies to the vicinity of the outlet of the discharge pipe from medical gas safety valves. Safety signs (refer to paragraphs 2.7 *et seq*) must be provided within and outside these areas to indicate this requirement, for example, "SMOKING, WELDING AND NAKED LIGHTS PROHIBITED – MEDICAL GAS STORAGE AREA". In addition, a notice clearly indicating the contents of these areas should be displayed.

8.30 Notices should be posted in wards and departments informing staff of the location of those medical gas control valves which should be turned off in the event of a major fire in the ward or department.

Access to manifold rooms and liquid oxygen storage areas

8.31 Access to the manifold room and liquid oxygen storage area should be controlled. A duplicate key of each should be kept in a locked box with transparent front cover at the main fire entrance, gatehouse or equivalent building, so that in the event of a fire, the fire brigade may obtain a key immediately on entering the hospital site. The transparent front of the box should be labelled:

BREAK COVER TO OBTAIN KEY
FOR EMERGENCY USE ONLY

Fire detection system

8.32 Smoke detectors should be installed in plantrooms, medical gases manifold rooms, and in ready-use medical gases cylinder stores in hospitals provided with an automatic fire detection system.

Sterilizing agents

8.33 Ethylene oxide is a highly-flammable toxic gas. Because of its hazardous nature, it should only be used in specialist units where appropriate safety measures have been provided as an integral part of the accommodation. It is about $1\frac{1}{2}$ times as dense as air, and mixtures of air in concentrations of 3% or more by volume are flammable. For cold sterilizing processes, it should be used only with a dilutant to reduce the flammability of the mixture. A 13% ethylene oxide 85% CO_2 mixture is frequently used. This mixture is flammable in certain combinations with air, and those concerned with the handling and use of this gas mixture should be made aware of the flammability hazards. The following precautions should therefore be observed:

a. avoid exposure to heat;

b. ensure that the purging of equipment and venting of sterilized equipment, including the venting of relief devices, is carried out in a safe area.

Oxygen therapy – precautions

8.34 When oxygen therapy equipment is in use, fire and safety warning signs/labels should be conspicuously displayed at the site of administration to alert the patient, clinical staff and visitors that oxygen is being used, and of the need to take precautions.

8.35 A suggested minimum text for a precautionary sign is:

OXYGEN IN USE

NO SMOKING
NO NAKED FLAMES

and the sign should contain the approved graphic symbols for "Hazard" and "No Smoking".

8.36 When oxygen is being administered in paediatric nursing units the text should include the precaution:

ONLY TOYS APPROVED BY THE HOSPITAL FIRE SAFETY ADVISER MAY BE GIVEN TO THE CHILD

8.37 Oxygen canopies and tents should be labelled, advising that oxygen is in use and that safety precautions relating to its use should be observed. Labels should be attached to the fabric of the canopy/tent in a position to be seen easily by the patient, and also on the exterior in a position to be seen easily by clinical staff and visitors.

8.38 Consideration may need to be given for signs in other languages.

Hyperbaric oxygen chambers

8.39 Hyperbaric oxygen chambers, which may still be used in some hospitals, may be pressurised with oxygen up to three atmospheres (30 psi gauge – 2 Bar). Pressurisation increases the fire risk still further and, in an emergency, it will take an appreciable time to remove an occupant. Therefore, the most stringent fire precautions to avoid ignition are necessary in and around hyperbaric oxygen chambers, including the design of electrical services. Oxygen which is exhausted or released from hyperbaric oxygen chambers should be dispersed safely to prevent the possibility of high oxygen concentrations in the event of an emergency release of oxygen from the chamber. This can be achieved by piping outlets direct to the

atmosphere, or by providing adequate mechanical extract ventilation in areas communicating with chambers. Fire extinguishers for use in the vicinity of hyperbaric chambers must have sufficient operating pressure to be effective in the higher ambient pressures.

Liquefied petroleum gases (LPG)

8.40 The Highly Flammable Liquids and Liquid Petroleum Gas Regulations (SI 1972-917) and the Home Office Fire Prevention Guide No 4 – 'Safe use and storage of liquefied petroleum gas in residential premises' must be consulted by all who use LPG appliances; paragraph 3.8 and sections 8 and 9 are of particular relevance. Health and Safety Executive Guidance Note CS 4 – 'The keeping of LPG in cylinders and similar containers' is also of relevance.

8.41 Commercially-marketed LPG is stored in liquid form, under pressure, in suitably-tested cylinders or bottles. When LPG escapes in liquid form it vaporises rapidly, forming a flammable gas-air mixture. Propane and butane are the most common LPGs used for heating, cooking and lighting purposes. They are appreciably heavier than air and if they escape they will descend to floor or ground level and concentrate there unless adequate low-level ventilation circulates and disperses them. Escaping gas can collect in drains, in pits, and in ground depressions or under suspended floors at ground level. Dangerous concentrations can explode in the presence of an ignition source.

8.42 The flammability limits of propane and butane in air are in the order of:

a. propane – 2.2% (lower limit), 9.5% (upper limit);

b. butane – 1.8% (lower limit), 8.5% (upper limit).

These are the percentages by volume of gas present in a gas-air mixture which will produce an ignitable vapour. A concentration of gas less than the lower limit, or greater than the upper limit, does not produce an ignitable vapour.

8.43 The release of about 1.0 kg of LPG into a room 3 m by 3 m by 3 m, when the gas is thoroughly mixed with air, will create an explosive mixture throughout the whole of the room.

8.44 The contents of LPG cylinders can be identified as follows:

a. red cylinder – propane;

b. blue or green cylinder – butane.

It is becoming standard practice to fit pressure relief valves to LPG cylinders, but there may be some cylinders in use which do not have valves fitted. If exposed to excessive heat, an unrelieved cylinder may explode, but this possibility is virtually eliminated by the fitting of a relief valve. An "empty" cylinder is still potentially dangerous. In this state the internal pressure is approximately atmospheric and if the valve is leaking or left open, air can enter the cylinder and may form an explosive mixture with the remaining gas.

8.45 Portable LPG heaters present particular hazards. They are not recommended for use in patient areas and areas of high fire risk. Where they are in use, they should be sited away from draughts and not placed within one metre of flammable materials. Preventive maintenance procedures should be adopted by estates departments and strictly observed.

8.46 The maintenance of LPG installations and appliances, including portable heaters, is the responsibility of specialist estates staff whose advice should be obtained where necessary, and who can make arrangements with equipment suppliers.

Disposable goods

8.47 The increasing use of disposable items made of paper, plastic and expanded foam can significantly increase fire risk unless appropriate precautionary measures are taken.

8.48 The storage of flammable disposable items should be restricted to amounts which are required for current use. These must be kept in containers or cabinets of non-combustible construction. Additional supplies should be kept in storerooms that are constructed and equipped for the purpose of storing these materials.

8.49 Safety Information Bulletins SIB(87)2 and SIB(88)9 deal with the additional fire precautions necessary for "totally soft play equipment" made from polystyrene foam. This guidance must be applied in healthcare premises.

Other potential hazards

8.50 Some additional attention to less obvious sources of fire is recommended. Oils and fats left on combustible materials such as cotton, wool, rags, etc will oxidise and may lead to smouldering and spontaneous ignition.

8.51 Static electrical charges can build up to levels where they may suddenly discharge to produce sparking, for example by the flow in pipes of dry gases, dusts or combustible liquids (such as benzene or light petroleum) in association with flammable vapour. Dust can present a real problem in some pharmaceutical operations and explosions caused by a spark may occur, especially where starch and dextrin are present. The problems of dry dust and fluff in laundries, and the spontaneous combustion of compacted linen after tumbler drying, are dealt with in section 7.0 of this document. They are further dealt with in Fire Practice Note 1 – 'Laundries'.

8.52 Precautions are also necessary where flammable solvents are used in connection with plastic splinting. Electric hairdryers should not be used to dry such materials.

8.53 For advice on the safe disposal of flammable liquids see paragraph 3.21.

Appendix 1

Number and origin of fires occurring in UK hospitals during 1989

A1.1

Principal statistics

Number of fires	2412
Confined to items first ignited	1701
Spread beyond item but confined to room	682
Spread beyond room of origin	29
Number of deaths	4
Number of casualties	128

A1.2

Place of origin

Place of origin	Number of fires	% of total
Kitchen	430	17.8
Ward	382	15.8
Lounge, common-room, dining	274	11.4
Bathroom/WC	240	10.0
Access areas	207	8.6
Laundry	138	5.7
Bedroom	120	5.0
Storage areas	92	3.8
Other medical services	86	3.6
Offices	65	2.7
Boiler rooms, workshops etc	42	1.7
Refuse room	28	1.2
Laboratory	23	0.9
Other	276	11.4
Unknown	9	0.4
	2412	100.0

A1.3

Source of ignition

Source of ignition	Number of fires	% of total
Smokers' materials	687	28.5
Deliberate fires	441	18.3
Cooking appliances	395	16.4
Lighting	150	6.2
Matches	141	5.9
Welding, cutting appliances	59	2.5
Wires and cables (fixed)	52	2.2
Specialised equipment	48	2.0
Tumble dryer	44	1.8
Wire and cables (leads)	41	1.7
Washing machines	25	1.0
Central heating	23	1.0
Space heating	21	0.8
Dishwashing machines	20	0.8
Others	247	10.2
Unknown	18	0.7
	2412	100.0

A1.4

Time to initial discovery

Initial discovery	Number of fires	% of total
At ignition	385	16
Within 5 minutes	1478	61
Between 5 and 30 minutes	402	17
Over 30 minutes	102	4
Unknown	45	2
Total	2412	100

A1.5

Materials first ignited

Materials first ignited	Number of fires	% of total
Waste	566	23.5
Electrical insulation	397	16.5
Food	317	13.1
Other textiles	185	7.7
Bedding, mattresses	166	6.9
Unspecified waste	81	3.4
Raw materials	53	2.2
Structure	43	1.8
Other furnishings	31	1.3
Upholstery	26	1.1
Vegetation	18	0.7
Lagging	17	0.7
Fittings	15	0.6
Clothing on person	14	0.6
Decorations/soft toys	8	0.3
Cleaning materials	6	0.2
Other	421	17.4
Unknown	48	2.0
	2412	100.0

These figures, compiled by the Fire Research Station, relate to fires in hospitals in the United Kingdom in 1989 which were reported to the fire service.

Appendix 2

Checklist: Preparing for a fire emergency

Knowing what to do

1. Managers and their staff will be better prepared for a fire emergency if they know:

a. how to raise the alarm and call the fire brigade;

b. how to get additional help in a fire emergency;

c. how to evacuate their part of the premises;

d. the location of fire-fighting equipment in every part of the health building. At each location information should be prominently displayed;

e. how to use the fire-fighting equipment in the local workplace, including any special needs and precautions;

f. how to deal with hazardous equipment during an emergency, for example gas cylinders etc;

g. who will switch off main supply sources (gas, electricity etc) and activate emergency systems during a fire emergency (records must be kept up-to-date);

h. that during a fire in any part of the hospital, telephones should be used for **essential** calls only.

Escape routes

2. Managers are recommended to carry out the following actions in conjunction with the hospital fire safety adviser:

a. consider the layout of the component parts of each healthcare premises and note the fire compartments, fire doors, escape routes, positions of fire alarm call points, of each;

b. ensure that the escape routes from each compartment **within** the premises have been agreed with the local fire authority. These should be marked on the plan;

c. identify with the local fire authority the parts of the healthcare premises and of neighbouring premises which could be used as safe-holding areas, so that progressive evacuation can be achieved;

d. note the location of any secured doors on escape routes and how exit **can** be achieved quickly, at all times:

   (i) emergency exit doors must open outwards;

   (ii) sliding or revolving doors are not permitted if they are specifically intended as emergency exits (but refer to (iii));

   (iii) emergency doors should not be so locked or fastened that they cannot be easily and immediately opened by any person who may require to use them in an emergency;

e. ascertain what features may obstruct escape routes or hinder evacuation, for example carpets or non-slip floors along escape routes will slow down evacuation;

f. get to know the designated escape routes. Inform staff of any changes that might affect their suitability, even temporarily, due to contractors working etc.

The information obtained from items (a) to (e), if displayed by means of a simple diagram, will help staff gain an appreciation of the escape routes.

Evacuation

3. The primary aims of evacuation are:

a. to remove patients, staff and others from immediate danger;

b. to keep the distance of any movement as short as possible;

c. to avoid routes which in the particular circumstances may need to be used by firemen and others involved in fire-fighting;

d. to remove patients to a reception area remote from the fire and suitable for their comfort and continued treatment, possibly for some hours, and to take a roll-call. (Be prepared – always have a dedicated clipboard and pen immediately available.)

These aims are broad guidelines. Fire is unpredictable and no two fires may be the same. Initiative, common sense, a sound knowledge of emergency procedures and a calm approach to an emergency will do much to ensure a satisfactory outcome.

4. The knowledge which managers have of the physical constraints of the parts of the health premises for which they are responsible, the capabilities of their staff, and the characteristics of the patients in their charge are essential to the formulation of evacuation plans. The following points will need to be considered when devising a plan. Plans will need to be reviewed and modified as necessary to take account of changed circumstances:

a. estimate the number of patients and staff who will need to be removed from the fire compartment or premises in a fire emergency and the time available for such evacuation;

b. consider the degree of dependency of patients and estimate the degree of surveillance and assistance they will require;

c. estimate the number of staff available both during the day and at night to cope with an emergency in each ward or part of the premises;

d. when estimating the number of staff available, consider their capabilities to cope with evacuation, that is, physical fitness, training and their likely performance under stress (especially part-time, agency or night staff). Moving sick people in an emergency is always very strenuous work;

e. consider the patient-handling methods which would be appropriate in an evacuation, bearing in mind building constraints on the escape route and the types of patients. Discuss and agree these with the hospital fire safety adviser;

f. identify and note the location of equipment which could be used to aid evacuation;

g. in the light of the preceding factors, estimate the number of extra helpers and their locations required to achieve the safe and speedy removal of all patients;

h. estimate the number of staff available within your premises who could give assistance in an emergency elsewhere;

j. know how to deal with patients on life-support equipment during an emergency (consult Firecode: FPN 3 – 'Escape bed lifts');

k. know how to deal with patients whose behaviour is likely to be obstructive during an evacuation;

m. practise aspects of the escape plan regularly, including patient-handling techniques, and involve all members of staff.

Appendix 3

Fire action notices

The following is an example of a staff fire action notice for display in all staff rooms, staff residential accommodation, and generally on notice-boards.

Fire action

.....(name of hospital and unit location)

1. If you discover or suspect a fire:

a. raise the alarm using the nearest break-glass alarm point. Know their locations at your place of duty, and elsewhere;

b. remove people from immediate danger;

c. fight the fire **(if it is safe to do so)** using available fire-fighting equipment;

d. close doors and windows in the immediate vicinity;

e. notify the telephone switchboard operator of all information relating to the fire. Ensure the fire brigade is called;

f. evacuate the area if necessary, to the principles of the agreed fire emergency plan.

2. If the fire alarm sounds:

a. confirm that the fire is not in your own area/zone;

b. close doors and windows;

c. one member of staff from each department should report to the appropriate fire alarm panel/control point and await instructions;

d. do not go to the scene of the fire unless specifically requested;

e. do not call the switchboard for information about the fire.

Your nearest fire alarm panel/control point is

_____

In addition to the more detailed staff instructions, brief, clearly-printed, general fire notices should be exhibited in conspicuous positions in all parts of the hospital. The following is an example:

- On detecting a fire, raise alarm immediately using the nearest break-glass alarm point.
- On hearing the fire alarm, proceed immediately to:

  .....

- Take a roll-call of persons evacuated (be prepared – always have a dedicated clipboard and pen immediately available).

Appendix 4

First aid fire-fighting equipment for use by staff

Types of fire extinguishers				
Type	**Colour code**	**Class of fire**	**Extinguisher action**	**Method of use**
Water	**Red**	**Class A** **Note:** Should not be used on live electrical equipment or burning oil.	Extinguishes mainly by cooling the burning material.	The jet should be directed at the base of the flames and kept moving across the area of the fire. Any hot spots should be sought out after the fire is out.
Foam	**Cream**	**Class B**	Extinguishes by forming a blanket of foam over the surface of the burning liquid and smothering the fire.	The jet should not be aimed directly into the liquid. Where the liquid on fire is in a container, the jet should be directed at the edge of the container or on a nearby surface above the burning liquid. The foam should be allowed to build up so that it flows across the liquid.
AFFF (Aqueous film-forming foam) **FFFP** (Film-forming fluoroprotein foam) **FP** (Fluoroprotein foam)	**Cream**	**Classes A and B** **Note:** Some foams are not suitable for use on live electrical equipment.	Extinguishes by forming a fire-extinguishing water film on the surface of the burning liquid. Has a cooling action with a wider extinguishing application than water on solid combustible materials.	For Class A fires the directions for water extinguishers should be followed. For Class B fires the directions for foam extinguishers should be followed.
Dry powder	**Blue**	**Class B** Safe on live electrical equipment although does not readily penetrate spaces inside equipment. A fire may re-ignite.	Extinguishes by knocking down flame.	The discharge nozzle should be directed at the base of the flames and with a rapid sweeping motion the flame should be driven towards the far edge until the flames are out. If the extinguisher has a shut-off control the air should be allowed to clear; if the flames re-appear the procedure should be repeated. WARNING Dry powder does not cool the fire very well and care should be taken to ensure that the fire does not start up again.
Dry powder (Multi-purpose)	**Blue**	**Classes A and B** Safe on live electrical equipment although does not readily penetrate spaces inside equipment. A fire may re-ignite.	Extinguishes by knocking down flames and on burning solids melts down to form a skin, smothering the fire. Has some cooling effect.	

Type	Colour code	Class of fire	Extinguisher action	Method of use
Carbon dioxide (CO_2)	**Black** 	**Class B** Safe and clean to use on live electrical equipment.	Extinguishes by vaporising liquid gas which smothers flames by displacement of oxygen in the air.	The discharge horn should be directed at the base of the flames and the jet kept moving across the area of the fire. WARNING CO_2 does not cool the fire very well; care should be taken to ensure that the fire does not start up again. DANGER Fumes from CO_2 extinguishers can be harmful to users in confined spaces. The area should therefore be ventilated as soon as the fire has been controlled.
Hose reel		**Class A** **Note:** Do not use on live electrical equipment.	Extinguishes mainly by cooling the burning material.	The jet should be aimed at the base of the flames and kept moving across the area of the fire.
Fire blanket **Light duty** **Heavy duty**		**Classes A and B** Suitable for burning clothing and small fires involving cooking fats and oil and burning liquids. In addition to the uses mentioned for light duty blankets, suitable for industrial use. Resistant to penetration by molten materials.	Extinguishes by smothering.	The blanket should be placed carefully over the fire and the hands shielded from the fire. Care should be taken that the flames are not wafted towards the user or bystanders.

Appendix 5

Ionisation type smoke detectors – radiation levels, safe storage and disposal

Legislation

1. The relevant legislation which is currently in force is:

a. the Ionising Radiation Regulations 1985;

b. Statutory Instrument No 953, dated 1980, headed 'Atomic energy and radioactive substances – the radioactive substances (smoke detectors) exemption order 1980' together with its amendment, Statutory Instrument No 477 dated 1991.

Safety Information Bulletin No 29, reference SIB(86)44 issued by the Department of Health, July 1986, headed 'Ionisation Chamber Smoke Detectors: Notification Requirements of the Ionising Radiation Regulations 1985', should also be consulted.

Detector radiation levels

2. Statutory Instrument No 953 defines two types of smoke detector containing radioactive material which are covered by the exemption to the Ionising Radiation Regulations 1985, namely:

a. Article 4(a) deals with smoke detectors containing americium 241, in which the total radiation level is less than 40 kilobecquerels (1.08 microcuries); and

b. Article 4(b) deals with smoke detectors containing radioactive material emitting a radiation level above that of 4(a), but not exceeding 4 megabecquerels (108 microcuries).

3. Modern smoke detectors containing americium 241 sources would normally comply with Article 4(a).

4. Old type smoke detectors, particularly those containing radium 226 sources, may fall into the category of Article 4(b), in which case the requirements as stipulated in Safety Information Bulletin SIB(86)44 should be followed.

5. Essentially this requires that the Health and Safety Executive/HM Inspectorate of Pollution be notified in writing of the presence of such detectors on the premises. In practice, such detectors would normally be permitted to be retained on site within fire detection and alarm systems, providing their replacement was undertaken in a reasonable period of time within the life expectancy of the equipment.

Detector storage

6. The total number of ionisation type smoke detectors complying with Article 4(a) which are unfixed and stored on the premises at any given time cannot exceed 500. Where the total quantity of such smoke detectors is less than 100, no special storage facilities are required. However, above this number all reasonably practicable measures should be taken to ensure that the detectors are kept in a store which:

a. is constructed, maintained and used so as to prevent the loss of unauthorised removal of the smoke detectors;

b. is constructed of non-combustible materials;

c. does not contain, and is not located close to, any explosive or flammable material;

d. is clearly and legibly marked with the word "Radioactive" and the radiation symbol conforming to the specification for a basic symbol to denote the actual, or potential, presence of ionising radiation, as published by the British Standards Institution (BS3510:1968 (a)), or the basic ionising radiation symbol published by the International Organisation for Standardisation (ISO 361:1975); and

e. incorporates all reasonably practicable measures to maintain on the premises clear, legible and up-to-date records on each smoke detector kept on the premises, and its location.

7. The Statutory Instrument and HMIP unfortunately fail to make clear the maximum number of smoke detectors falling within Article 4(b) that can be stored on the premises at any given time. It is reasonable to assume, however, that storage facilities would be required to be of a standard not less than that required for the storage of smoke detectors falling within Article 4(a) in quantities above 100. In practicable circumstances definitive guidance should be sought from your local HMIP Inspector.

Detector disposal

8. Smoke detectors falling within Article 4(a) may be disposed of by one of the following means:

a. sending them to, or causing or permitting their removal by, a person who is authorised under section 6(3) of the Radioactive Substances Act 1960, to dispose of them as radioactive waste, or under a description to which the waste belongs;

b. sending them to, or causing or permitting their removal by, a manufacturer of smoke detectors of the same description as the waste;

c. causing or permitting their removal as refuse by a waste collection authority or their contractors.

9. Where the smoke detectors are disposed of as refuse by a waste collection authority they need not be notified in advance provided that:

a. the waste is dispersed within other refuse which is not radioactive waste;

b. the detectors are mixed such that the total sum of kilobecquerels of radioactivity in any 0.1 cubic metre of the whole mass of the waste and refuse does not exceed 40 (1.08 microcuries).

10. The disposal of radioactive waste comprising of a smoke detector falling within Article 4(b) is subject to the condition that it is disposed of by one of the means referred to above, except that which permits their removal by a waste collection authority or their contractors.

Fixed smoke detectors

11. Exemption is granted without any limitation or condition in respect of the keeping and use of the radioactive material contained within smoke detectors in compliance with Article 4(a).

12. With regard to smoke detectors falling within Article 4(b), exemption is granted in respect of the keeping and use of these detectors provided the following conditions are met:

a. no incorporated source is mutilated;

b. whenever there are reasonable grounds for believing or suspecting that an incorporated source has been lost or stolen:

   (i) notification to that effect is given forthwith, by the quickest means available, to a member of the police force and to the "Chief Inspector" (as appointed under the Radioactive Substances Act 1960) and confirmed to the latter in writing as soon as practicable;

   (ii) all reasonably practicable measures are taken forthwith for the purpose of recovering the source;

c. whenever there are reasonable grounds for believing or suspecting:

   (i) that the immediate container, or the bonding forming part of an incorporate source, is broken or damaged; or

   (ii) that any radioactive material has become detached, or has escaped from an incorporated source because of some defect therein;

notification to that effect is given forthwith, by the quickest means available, to a "Chief Executive" and confirmed to him in writing as soon as practicable.

13. Those persons within a health authority or trust hospital who are responsible for safety and waste disposal matters should be aware of these procedures.

Appendix 6

Corresponding legislation etc in Northern Ireland

Text reference	Northern Ireland equivalent
Section 60 (7) of the NHS and Community Care Act, 1990	Article 8 (2) – The Health and Personal Social Services (NI) Order, 1991
NHS trusts	HSS trusts
Fire Precautions Act, 1971 (as amended by the Fire Safety and Safety of Places of Sport Act, 1987)	Fire Services (NI) Order, 1984
Fire Precautions (Places of Work) Regulations	Similar provisions are envisaged for NI
Health Equipment Information No 76, Jan 1979	
Environmental Protection Act (EPA 90) Section 1	The Health and Personal Social Services (NI) Order, 1991 – Article 7
Her Majesty's Inspectorate of Pollution (HMIP)	Department of Environment for Northern Ireland (Environmental Protection Division), Calvert House, Belfast
Ionising Regulations, 1985	Ionising Regulations (Northern Ireland), 1985
DS 164/75, HN(76)95 (refer to paragraph 7.51)	006/81/56

Appendix 7

Other Firecode publications

Details are given of all other documents which together with this HTM form Firecode. The information is correct at the time of publication of this document.

Firecode

Policy and principles, 1994.
Directory of fire documents, 1987.
Nucleus fire precautions recommendations, 1989.

Health Technical Memoranda

HTM 81 Fire precautions in new hospitals, 1987, with Supplement 1, 1993.
HTM 82 Alarm and detection systems, 1989.
HTM 85 Fire precautions in existing hospitals (due mid-1994 to replace Home Office Draft Guide, on the same subject).
HTM 86 Assessing fire risks in existing hospital wards (new edition due mid-1994, to replace 1987 edition).
HTM 87 Textiles and furniture, 1993.
HTM 88 Fire safety in healthcare premises: guide to fire precautions in NHS housing in the community for mentally handicapped (or mentally ill) people, 1986.

Fire Practice Notes

1 Laundries, 1987.
2 Storage of flammable liquids, 1987.
3 Escape bed lifts, 1987.
4 Hospital main kitchens, 1994.
5 Commercial enterprises on hospital premises, 1992.
6 Arson prevention and control in NHS healthcare premises, 1994.

Other publications in this series

(Given below are details of all other Health Technical Memoranda available from HMSO. HTMs marked (*) are currently being revised, those marked (†) are out of print. Some HTMs in preparation at the time of publication of this HTM are also listed.)

1 Anti-static precautions: rubber, plastics and fabrics*†
2 Anti-static precautions: flooring in anaesthetising areas (and data processing rooms)*, 1977.
3 –
4 –
5 Steam boiler plant instrumentation†
6 Protection of condensate systems: filming amines†
2007 Electrical services: supply and distribution
8 –
9 –
10 Sterilizers*†
2011 Emergency electrical services, 1993.
12 –
13 –
2014 Abatement of electrical interference, 1993.
15 Patient/nurse call systems†
16 –
17 Health building engineering installations: commissioning and associated activities, 1978.
18 Facsimile telegraphy: possible applications in DGHs†
19 Facsimile telegraphy: the transmission of pathology reports within a hospital – a case study†
2020 Electrical safety code for low voltage systems, 1993.
2021 Electrical safety code for high voltage systems, 1993.
22 Piped medical gases, medical compressed air and medical vacuum installations*†
22 Supp. Permit to work system: for piped medical gases etc†
23 Access and accommodation for engineering services†
24 –
25 –
26 Commissioning of oil, gas and dual fired boilers: with notes on design, operation and maintenance†
27 Cold water supply storage and mains distribution* [Revised version will deal with water storage and distribution], 1978.
28 to 39 –
2040 The control of legionellae in healthcare premises – a code of practice, 1993.
41 to 53 –

Component DataBase (HTMs 54 to 70)

54.1 User manual, 1993.
55 Windows, 1989.
56 Partitions, 1989.
57 Internal glazing, 1989.
58 Internal doorsets, 1989.
59 Ironmongery, 1989.
60 Ceilings, 1989.
61 Flooring, 1989.
62 Demountable storage systems, 1989.
63 Fitted storage systems, 1989.
64 Sanitary assemblies, 1989.
65 Signs†
66 Cubicle curtain track, 1989.
67 Laboratory fitting-out system, 1993.
68 Ducts and panel assemblies, 1993.
69 Protection, 1993.
70 Fixings, 1993.
71 to 80 –

New HTMs in preparation

Lifts

Combined heat and power

Telecommunications (telephone exchanges)

Washers for sterile production

Ventilation in healthcare premises

Risk management and quality assurance

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Health Facilities Notes – debate current and topical issues of concern across all areas of healthcare provision. *HMSO*

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